ENGINEERING AND
BOILER HOUSE REVIEW

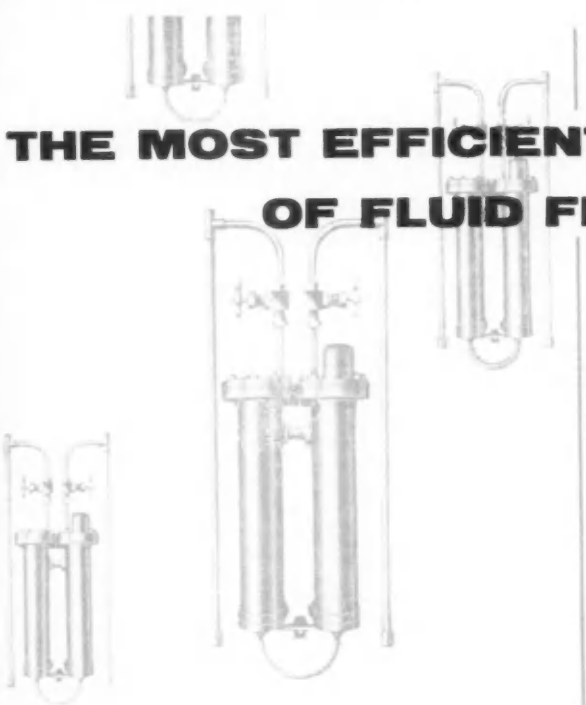
ESTABLISHED 1899

TWO SHILLINGS & SIXPENCE

VOL. 75 NO. 1 • THE PIONEER STEAM JOURNAL • JANUARY, 1960

Electroflo
Meters & Controls

THE MOST EFFICIENT MEANS OF FLUID FLOW MEASUREMENT



1 One operating principle — one general construction mode — for all fluids and gases under all conditions of measurement. Minimum service requirement.

2 Standardised, independent and interchangeable reading instruments — located at any distance from actual measuring point: separated, grouped or duplicated to meet any operating or supervisory requirement.

3 Linear scales. Square root extraction effected by parabolic contour of resistance element.

4 Full 4" mercury rise.

5 Unrestricted mercury column gives maximum sensitivity to flow rate changes. Accurate to within ±0.5%. Differential pressure change modifies circuit resistance. Conductance proportional to flow rate: easily checked in situ by substitution of standard resistance.

6 A.C. mains operation: unaffected by supply voltage and frequency variations.

7 NO CASTINGS. — Interchangeable tubular manometer with drop-forged ends. Readily available for any specified line pressure. No glands: integral equalising valve: over-range protection and dirt traps.

8 High-speed, frictionless integration. Integration is totalising conductance meter measuring amperes x time: volts.

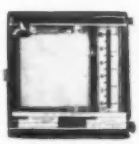
9 Wide choice of interpretive instruments — see illustrations.

10 Equipped for data reduction: control circuits and available for long distance transmission. Also accepts 3-15 p.s.i. pneumatic signal. Further particulars on application.

'Miniature' instruments for graphic consoles and comprehensive supervisory panels.

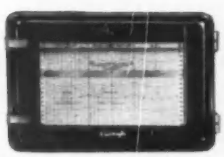
Model No. 365 6"x 6" rate of flow indicator

Model No. 259 6"x 6" high-speed integrator



Model No. 199 4", 1000-hour strip chart recorder

Model No. 355 12" diam. rate-of-flow indicator



Model No. 350 multi-point, 12" continuous roll chart recorder

Model No. 224 12" diam. recorder: 10½" diameter linear chart

Model No. 223 10" scale edgewise type rate-of-flow indicator

TENS OF THOUSANDS IN OPERATION IN EVERY CLASS OF INDUSTRY THROUGHOUT THE WORLD. FOR FURTHER PARTICULARS, ASK PUBLICATIONS DEPARTMENT FOR CATALOGUE No. 65

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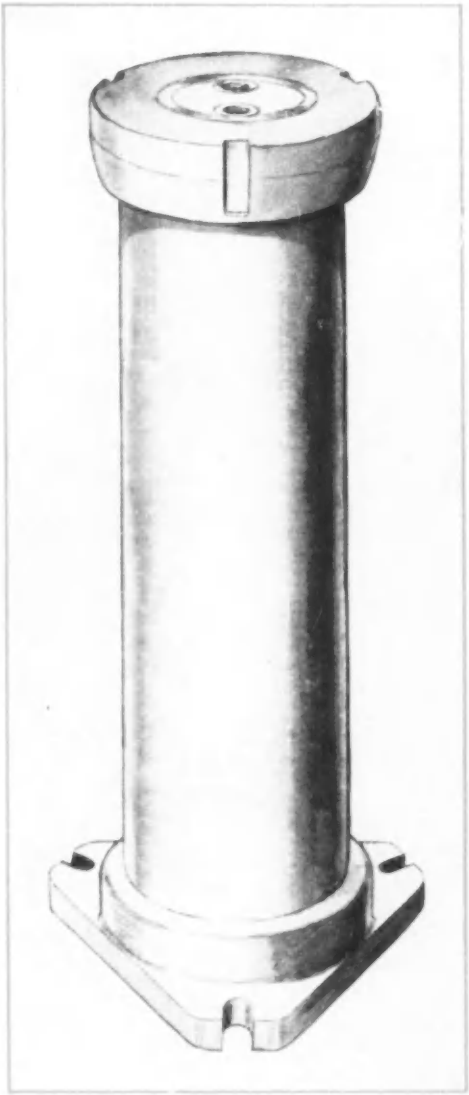
LOCKHEED

Air-loaded, piston separator type

HYDRAULIC ACCUMULATORS



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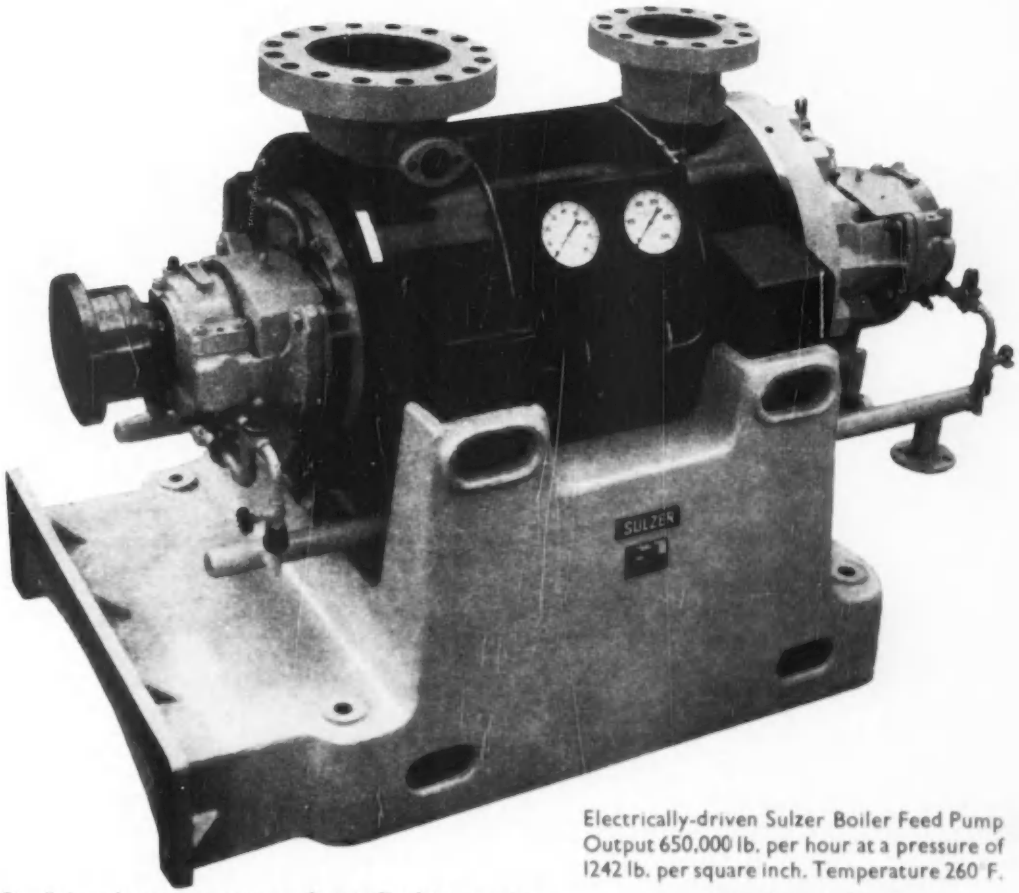
BOILER-FEED PUMPS



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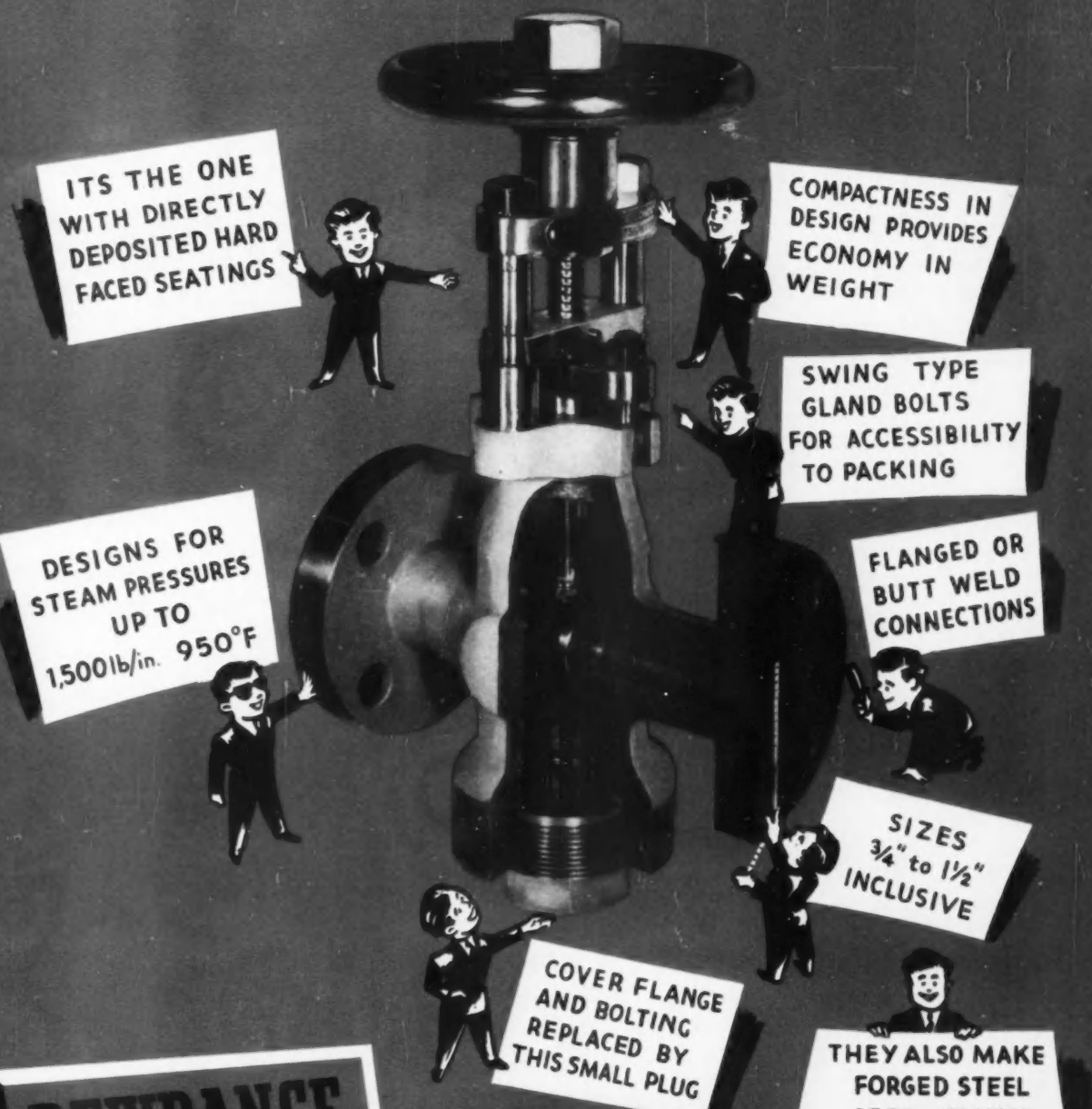
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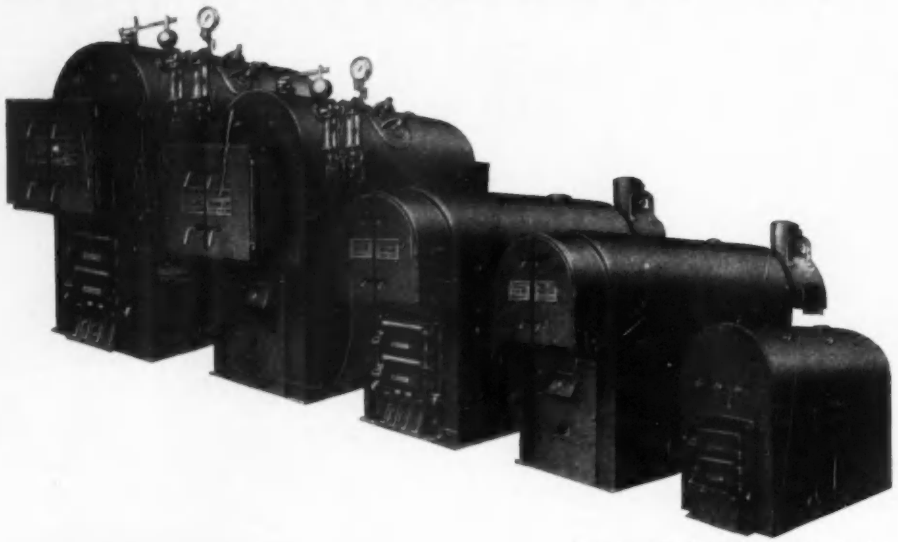

Boilers by Hartley & Sugden Ltd., Halifax

A section of copper piping showing heavy scale deposit

The same section after treatment with Starit

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Is there a falling-off in steam raising? Do you suspect metal stress, or serious loss of heat during transfer from fuel to water? These and kindred questions in connection with boilers and feed pipes can be an indication of scale deposit that lowers the efficiency so vital to economical steam raising.

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Starit is successful in most cases of scale deposit, but as some scale is immune to chemical treatment, send us a sample. We will then determine the suitability of Starit for your particular problem and send you a booklet dealing with the uses of Starit and methods of its application.

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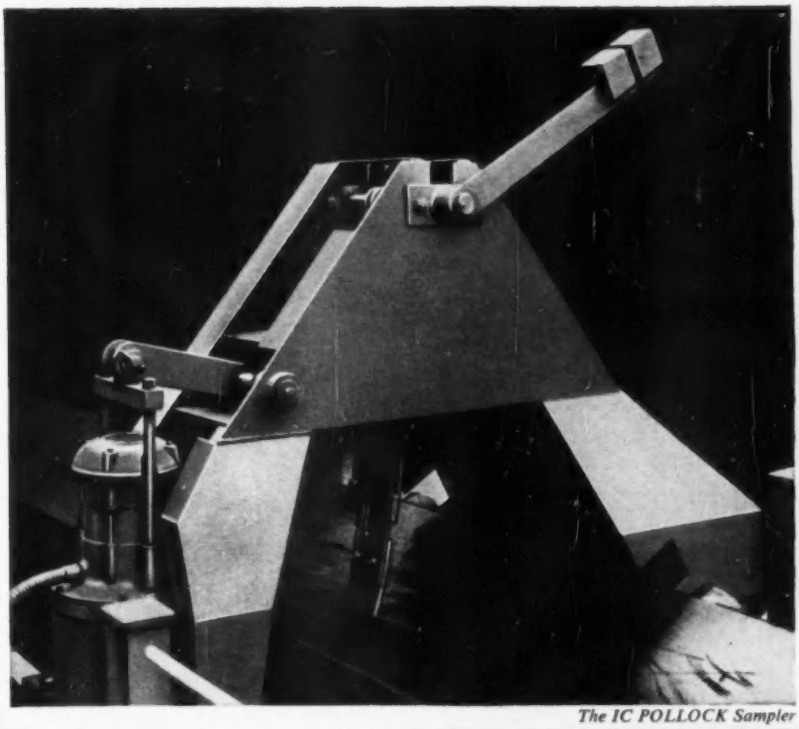

The IC POLLOCK Sampler

The TYLER Sample Reducer
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The RO-TAP Sieve Shaker
provides a uniform mechanical shaking method from test to test. It handles up to thirteen 8-in. diameter sieves in a single operation.

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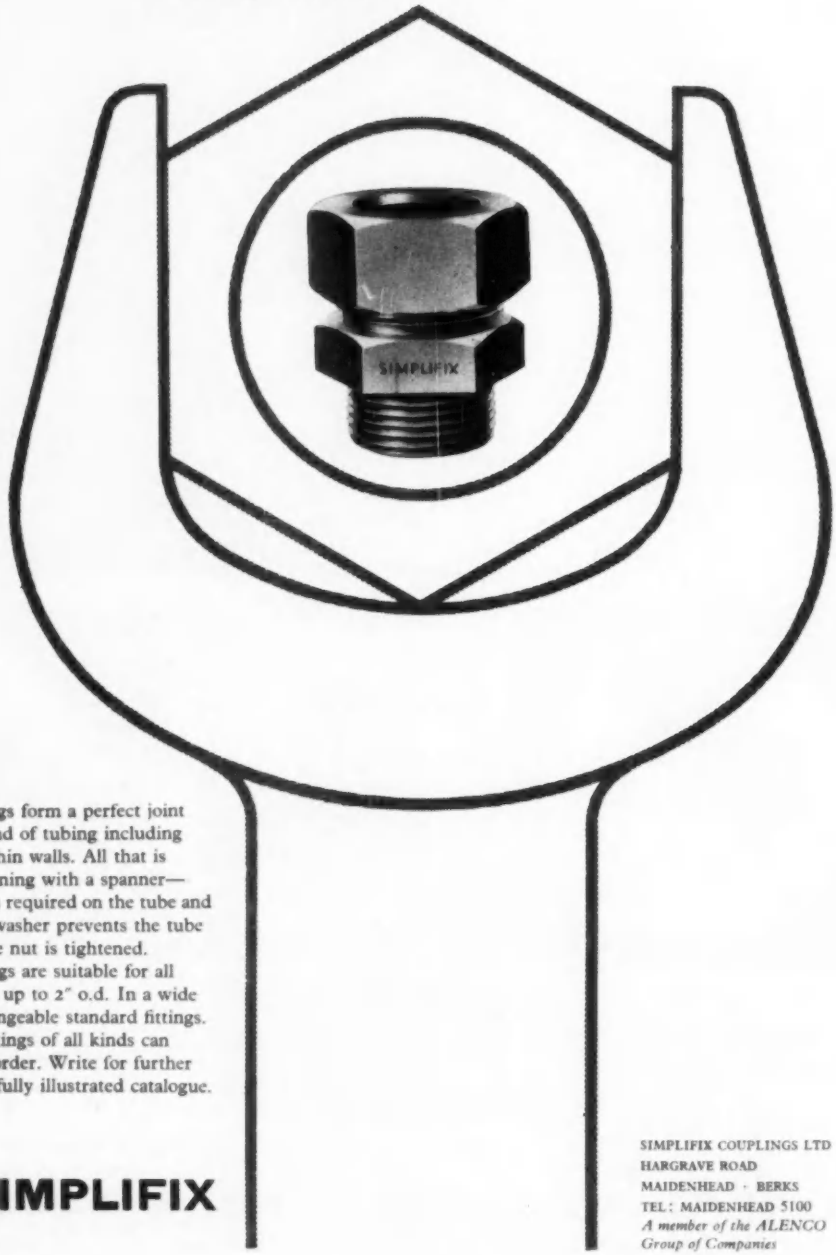

Simplifix couplings form a perfect joint on almost any kind of tubing including those with very thin walls. All that is required is tightening with a spanner—no special work is required on the tube and the anti-friction washer prevents the tube twisting when the nut is tightened. Simplifix couplings are suitable for all pipe line systems up to 2" o.d. In a wide range of interchangeable standard fittings. Non-standard fittings of all kinds can also be made to order. Write for further information and fully illustrated catalogue.

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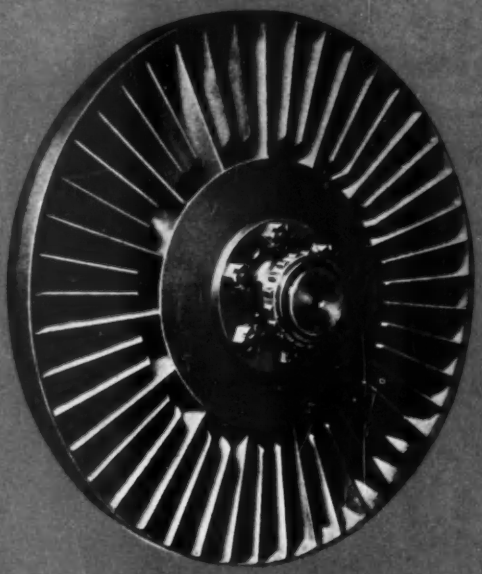

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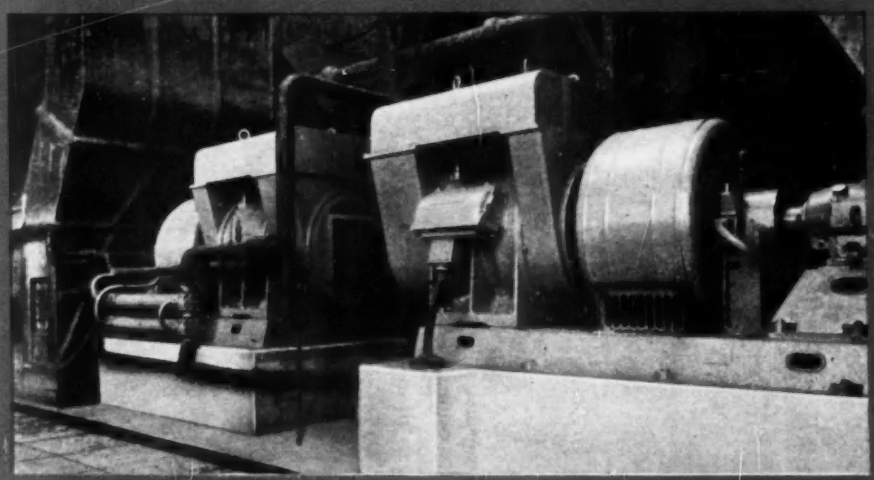

I.D. fan driven with S.C. motors of 479 h.p. at 740 r.p.m. and size 41 Vulcan-Sinclair steep-control fluid couplings at Stella South Power Station of the N.E. Division of the Central Electricity Generating Board.

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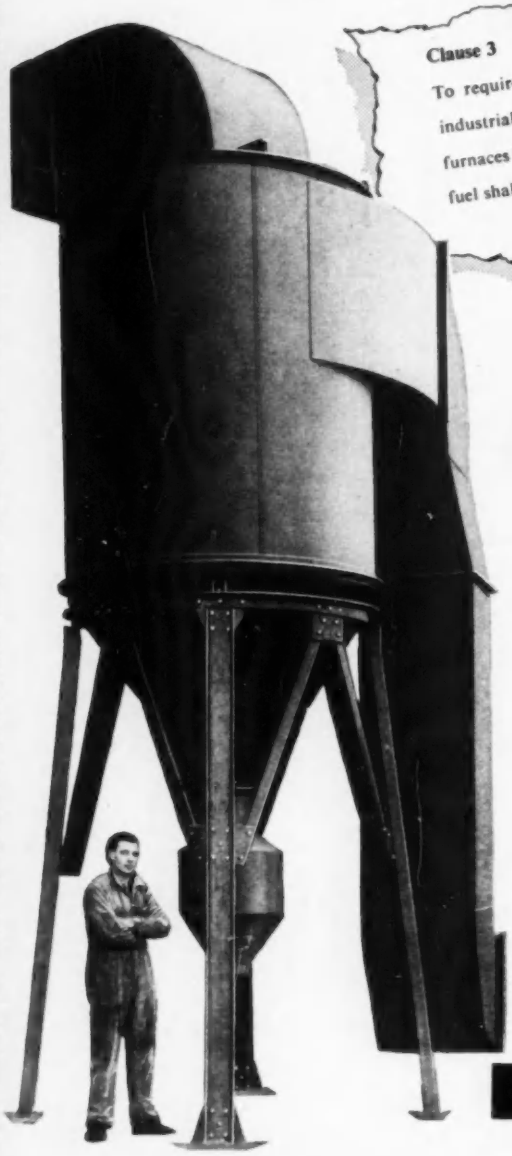

Cyclone Patent Grit Arrester installed at Reading.

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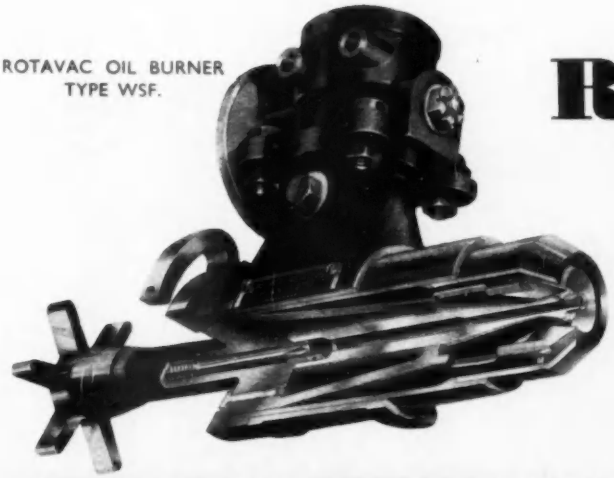

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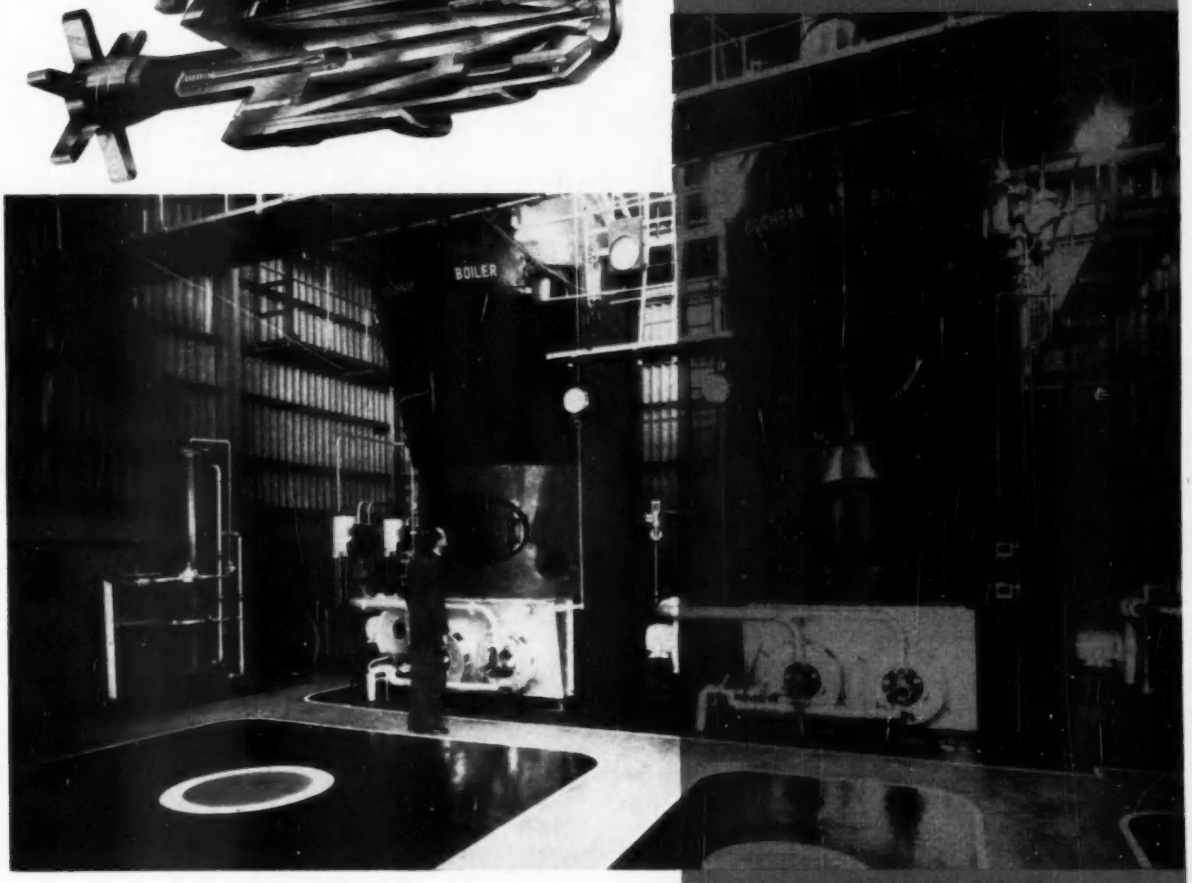

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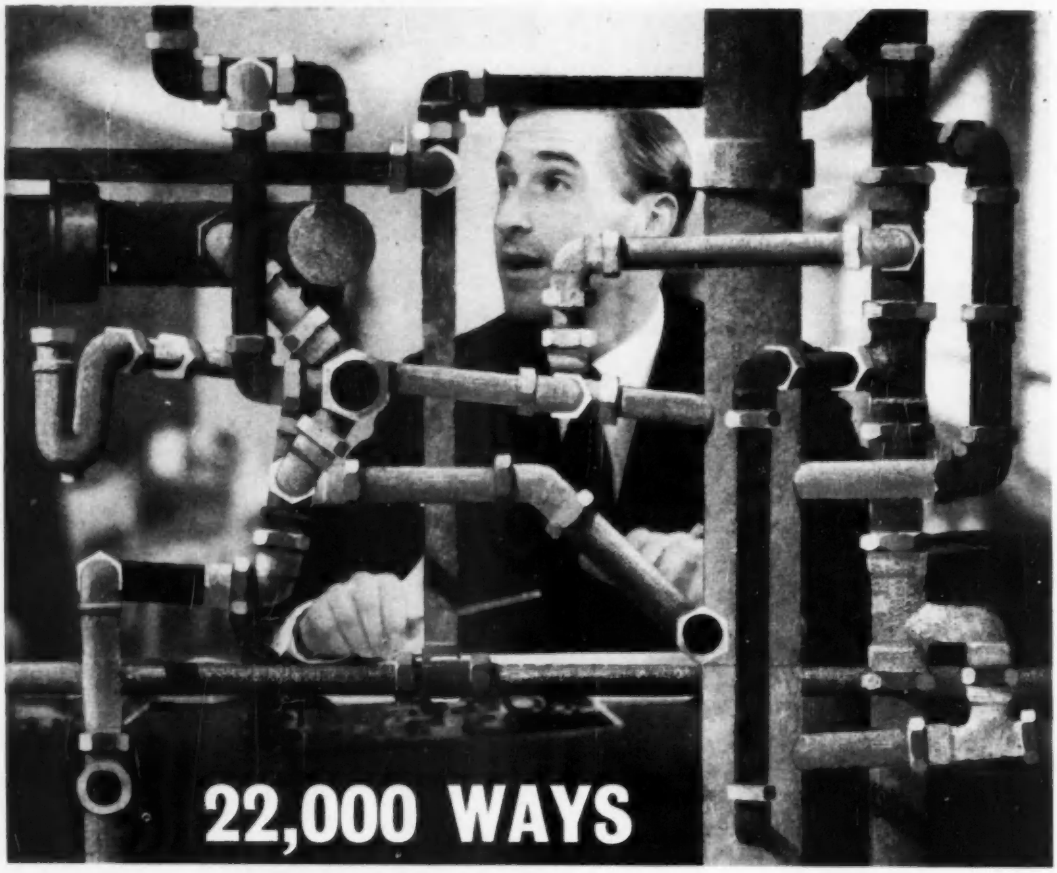

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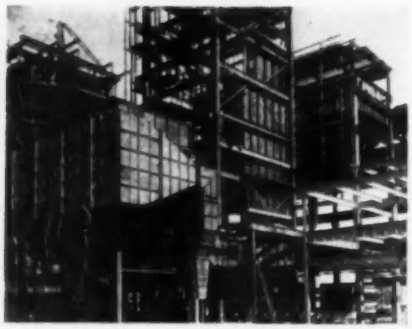
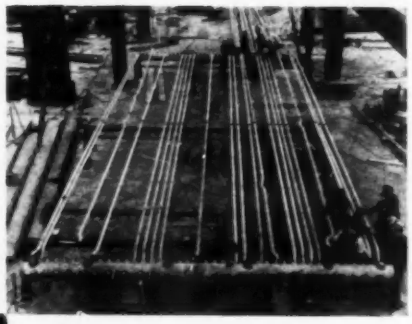
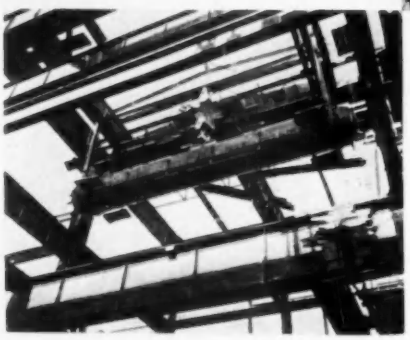


Little Barford B Power Station
"Outdoor installation of 2 boilers."



Aberthaw Power Station
"Panel wall construction on site for one of 6 boilers."



Drakelow Power Station
"Drum lift for one of 3 boilers."

BOILERS UNDER CONSTRUCTION

by

FOSTER WHEELER

For the Central Electricity Generating Board

Northfleet Power Station
"Tube wall assembly for one of 6 boilers."

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Riley pressure jet oil burners exploit higher air and oil pressures than are usual today. They are factory-set to give high efficiency.
There are Riley Oil Burners with throughputs ranging up to 700 lb. per hour.

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For capacities above 10 gallons per hour, incorporating one small and one large air register, each with its own atomiser, to give optimum efficiency whether one or both are in operation. At low flow only the small burner is alight. At high flow both are alight, thus giving an ideal combination for variable load conditions. Design allows for hot oil circulation to both atomisers before ignition to ensure clean start and self cooling of large burner on shut down. Used for most types of heating and industrial boilers, with 220 secs. oil and, on the larger models, 950 secs. or 3,500 secs. oil.

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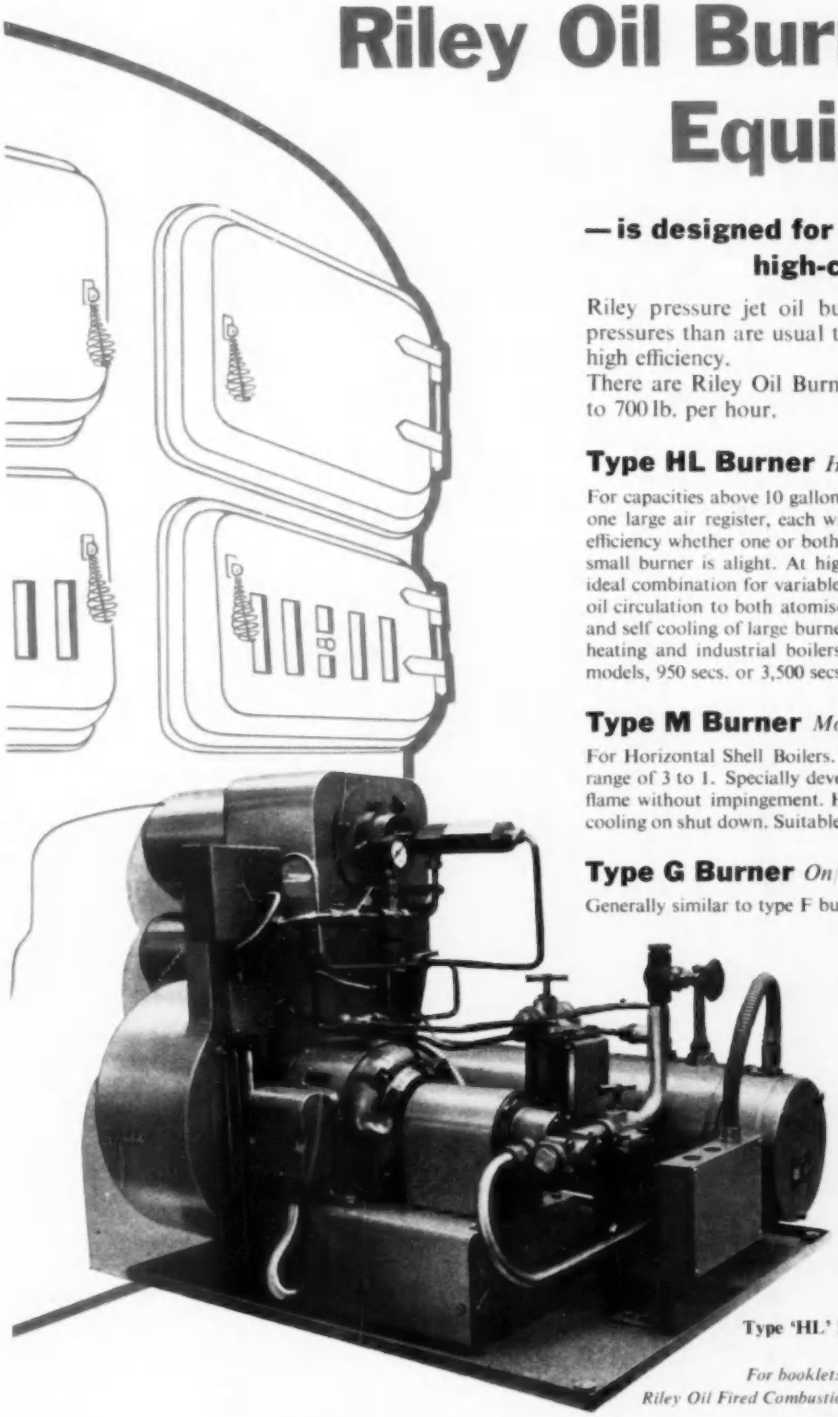
For Horizontal Shell Boilers. Spill return type atomiser with output range of 3 to 1. Specially developed air register to give clean narrow flame without impingement. Hot oil circulation on starting and self cooling on shut down. Suitable for 220 secs. 950 secs. or 3,500 secs. oil.

Type G Burner *On/Off Operation*

Generally similar to type F burner but uses 40 secs. oil.



Type 'HL' Burner

Type F Burner

On/Off Operation

Available in capacities from 20 lb. to 90 lb. per hour, using 220 secs. oil. Factory-set air/oil ratios and pressures give suspended intense flame and do not require further adjustment.

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These undesirable deposits will eventually form but DOHMseal ensures their easy removal without damage to the refractory lining.

Fuel saving and reduced maintenance costs result from the use of DOHMseal, which more than pays for the small expenditure incurred.

Repair refractory linings and fabricate monolithic refractory shapes with DOHMpatch—finish with DOHMseal.

CENTRAL ELECTRICITY GENERATING BOARD

Close-up of slag adherance chipped away, showing DOHMseal treated bricks beneath. Without the application of DOHMseal the boilers need to be rebricked every six months.

By treating bricks with DOHMseal, which allows easy removal of slag, there is no necessity to rebrick for a year or more.

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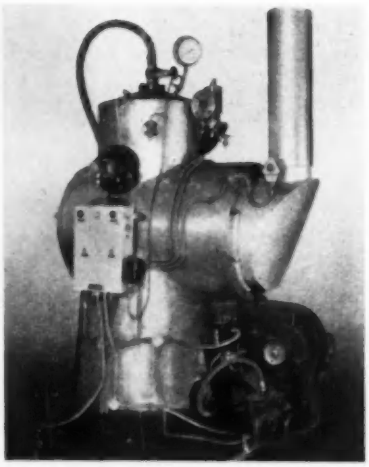
dark horses indeed....



. . . for the outstanding performance of the Spanner Donkey is a constant surprise even to the most knowledgeable student of form.

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Spanner Donkeys have a long and honourable pedigree—by Know-how out of Experience they have all the points that keep them unrivalled in the Championship Class.

SWIRLYFLO 'DONKEY' BOILERS

In brief: sizes from 200 to 10,000 lb. steam per hour up to 200 p.s.i.g., packaged, self-contained design with low radiation loss; automatic or hand-fired oil burning water-cooled furnace; Swirlyflo high efficiency tubes; complete with feed pump and necessary valves, cocks and gauges. Built to the requirements of M.O.T., Lloyds, and all principal Insurance Companies.

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From Boiler Back to Chimney Stack

GREENS

INTEGRATED BOILER AUXILIARY UNITS

* Compactness
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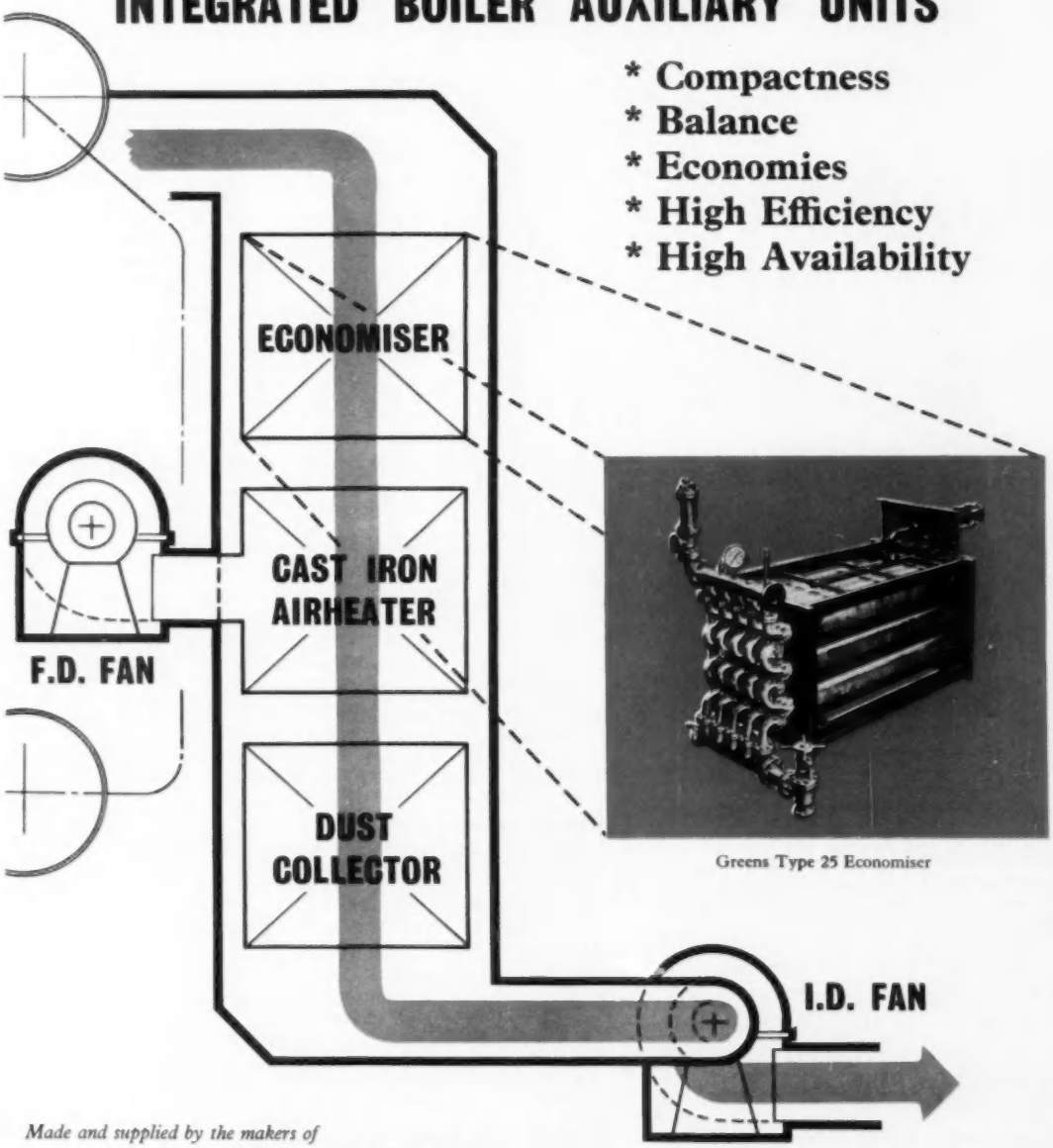

Greens Type 25 Economiser

Made and supplied by the makers of the world famous Greens Economiser

E. GREEN & SON LTD · WAKEFIELD

GE 208

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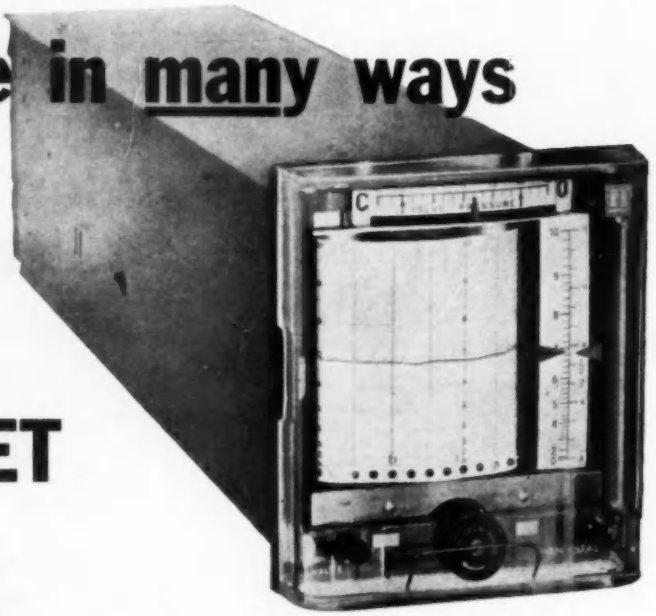
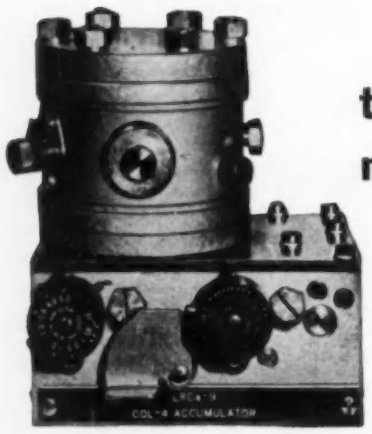
you save in many ways with TEL-O-SET





Quick connect Tel-O-Set controller, for proportional control—with automatic reset—of any variable. Derivative action is easily added.

today's most advanced miniature pneumatic instruments

Record, indicate or control any process variable with versatile Tel-O-Set instruments. They're the most dependable, economical, and easily-serviced miniature instruments you can buy.

CUT INSTALLATION COSTS
- Startup is safeguarded by wiring and piping case separately . . . keep chassis safe in original carton until startup.
- Quick-connect design makes chassis mounting easy, fast, foolproof.

CUT SPARE PARTS INVENTORY
- Change recorder to indicator and vice versa . . . without changing case or disturbing field connections.
- One basic controller model for any variable—derivative action easily added.

REDUCE PROCESS DOWNTIME
- All working parts can be inspected during operation, without process interruption.
- Zero and span, the only recorder adjustments required, are set from front of panel.
- Quick connect switch on controllers permits removal of unit while process remains on manual control.

SAVE IN MAINTENANCE
- Separate pneumatic and electric connections—no need for electrician to stand by.
- Linearity built in at factory, requires no attention.
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Honeywell Controls Ltd, Ruislip Road East, Greenford, Middlesex. WAXlow 2333

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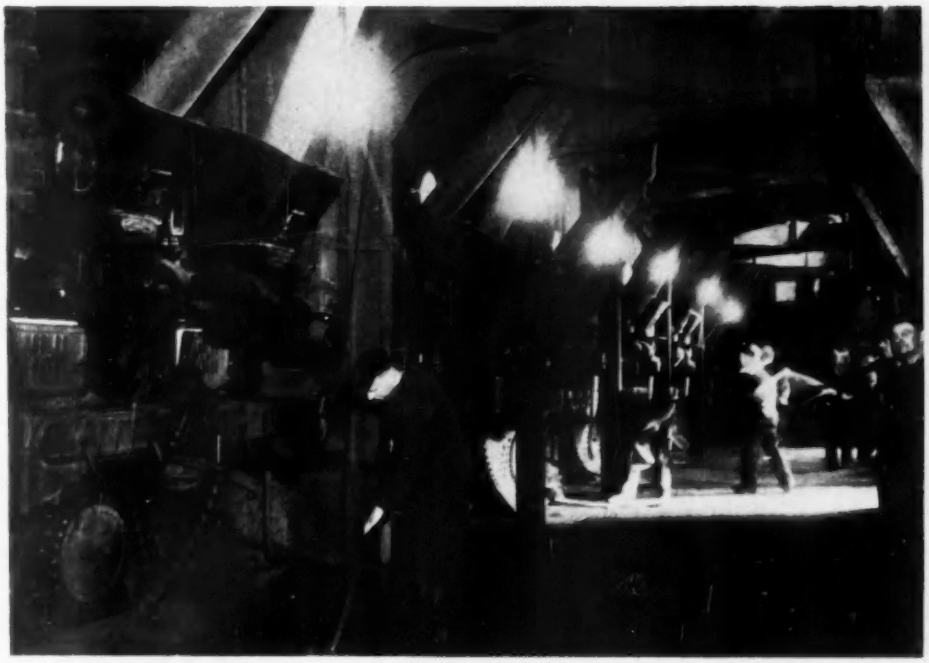

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are often an UNKNOWN FACTOR

Our investigation may result in a considerable economy

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INSTALLED UNDER GUARANTEE ENSURE EFFICIENT AND **SMOKELESS** COMBUSTION

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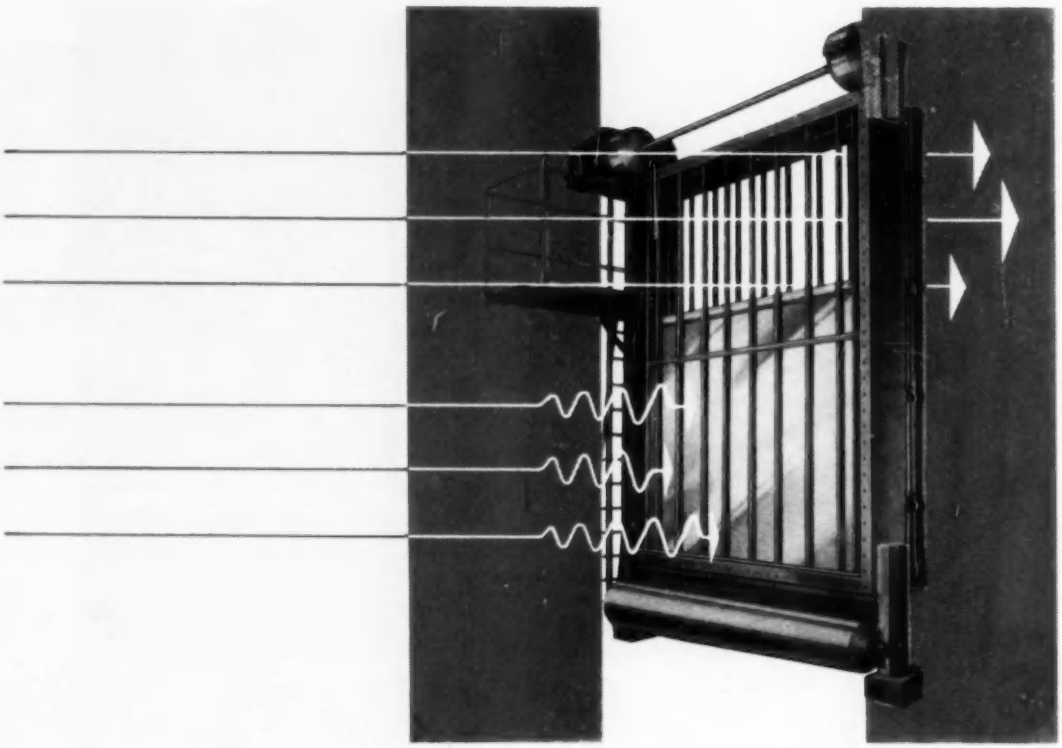
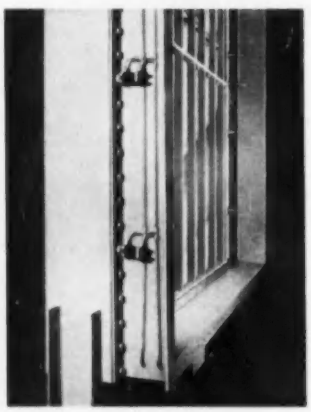
238b, GRAYS INN ROAD, LONDON, W.C.1



The Dowling Damper



AT LONG LAST . . . a Damper to meet with the conditions in Boiler and Power Station Flues and yet require the minimum of maintenance. The well-known difficulties of traditional arrangement are overcome with the Dowling Damper which provides an economical and reliable seal between flue sections of all sizes. It is designed and constructed to withstand varying conditions of temperature, gas pressure, acids and dust that are prevalent in Boiler and Power Station Flues. It can be hand operated or power driven and supplied with air-operated seals if required.

Several large contracts have been successfully negotiated for new Electrical Power Station projects and other applications are being considered daily. Conversions of existing unsuccessful Damper Installations to Dowling-type Installations have also been undertaken with good results.

Enquiries are invited for application in new Power Station projects, Boiler House installations and other applications in the Gas, Chemical, Cement and other industries where the control of hot gas and dust is required in ducting systems and chimneys. Write for fully descriptive leaflet to:

THORNTON

B. Thornton Ltd., Turnbridge, Huddersfield. Tel.: 7541

My friend will now perform an amazin' trick . . .

He's limbering up to demonstrate that you can fit the Spirax 'TD' upside down if you want to. Or sideways.

Actually, it's no more amazing than all the other virtues of the remarkably versatile Spirax thermodynamic steam trap.

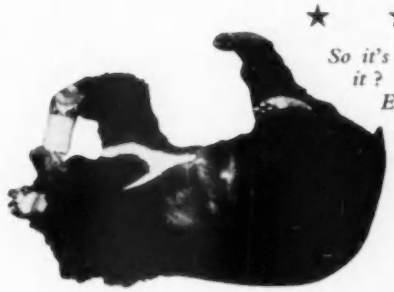
For instance ? No adjusting or valve changing over its whole pressure range of 8-350 psi. Only one moving part—a stainless steel disc (how about that for maintenance ?). Blast discharge action and clean cut-off, with astonishing capacities. Temperature limit 550° F.

It takes superheat, waterhammer, vibration, corrosive condensate and freezing in its stride. (Try freezing one and then thawing it out with a blowlamp—that really *is* an amazin' trick.)

You can have the 'TD' screwed ($\frac{3}{8}$", $\frac{1}{2}$" and $\frac{3}{4}$", all stainless steel) or flanged ($\frac{1}{2}$" and $\frac{3}{4}$", forged steel with stainless steel inserts). All except the $\frac{3}{8}$" have inbuilt stainless steel strainers.

And it's so small, so handy to order and stock. Not to mention fitting.

★ ★ ★ ★ ★



So it's the universal steam trap, is it ? No, there's no such thing. Even the Spirax 'TD' has one or two limits—but within them it's a humdinger. May we bring you up-to-date (especially on the new lower prices)?

SPIRAX - SARCO

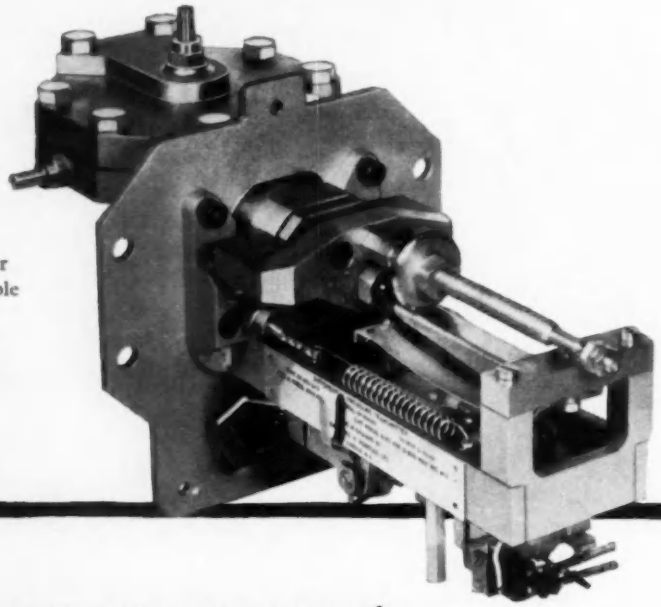
Please send more than the bare details of the Spirax 'TD' steam trap range

NAME

ADDRESS

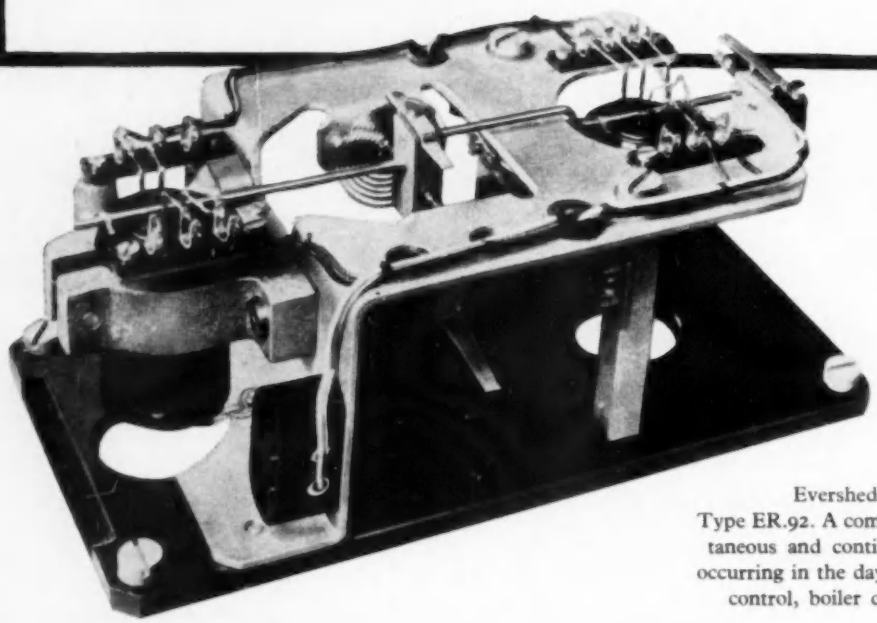
EB 160

Spirax-Sarco Ltd. Cheltenham Glos. Phone: Cheltenham 5173 Spirax Telex Cheltenham London: 28 Victoria Street SW1 Abbey 6101-3833



Evershed flow or differential pressure transmitter, Type ER.125, designed for accurate measurement and to give reliable service under the most exacting conditions. Suitable for oil, viscous or corrosive fluids, water, steam or gases.

Where measurements matter most — You will find EVERSHED instruments



Evershed simple analogue computer, Type ER.92. A computing device for the instantaneous and continuous solution of equations occurring in the day to day operation of process control, boiler control or the control of gas or fuel flow systems.

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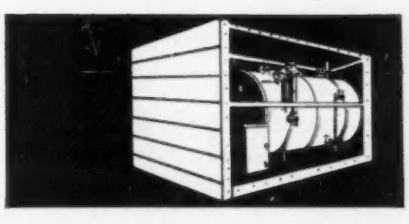
let's not take any chances, let's install a STEAMBLOC packaged boiler

A STEAMBLOC packaged boiler is in every way the most economic means to profitable steam raising. It also offers this important advantage . . . every STEAMBLOC boiler is fully automatic and supplied as a *complete* unit. Burner, feed pump, oil pump, oil heater, fan, control gear . . . *all ancillaries are supplied with the unit*, which is steamed and tested before despatch. Average efficiency exceeds 82.5% over modulating range. Steambloc boilers are available with capacities up to 25,000 lb/hr: write NOW for further details and a copy of Publication No. 1628/4.

A product of the Babcock & Wilcox organisation



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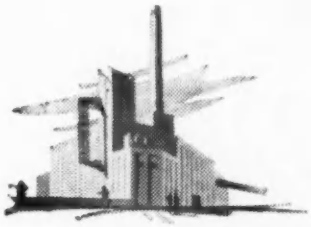
Tate and Lyle are sweet on Coal



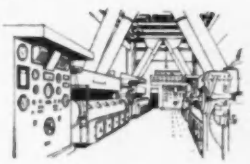
TROPICAL PLANTATIONS for cane sugar, English fields for sugar beet. And, for Tate and Lyle, British coal to begin the processes that put an endless supply of pure sugar into the larders of Britain.

The shrewd men who direct this great sugar business choose coal because coal, efficiently burned on mechanical stokers, provides accurately controlled heat for the lowest cost per lb. of steam; because coal—mechanically stoked—burns smokelessly; and because the coalfields of Britain can supply all industrial demands for generations to come.

When it's your turn to make a decision about fuel, remember Tate and Lyle. Their experience could profitably sweeten your financial cup of tea.

Here are some key facts and figures about the Tate and Lyle power houses at their refineries in London and Liverpool

The boiler houses at the three Tate and Lyle refineries raise together 890,000 lbs. of steam per hour at 650 lbs. per sq. inch at 82% efficiency, which pass through turbines to generate 24 Mw. of electricity of which 4 Mw. is re-exported to the grid. The steam then goes to the process, and the power and heating operation has an overall thermal efficiency of 72%. The coal burnt amounts to over 300,000 tons per annum of washed smalls.



PROGRESSIVE INDUSTRY IS GOING FORWARD ON

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Guaranteed SMOKELESS COMBUSTION

with the new

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COMBUSTION UNIT

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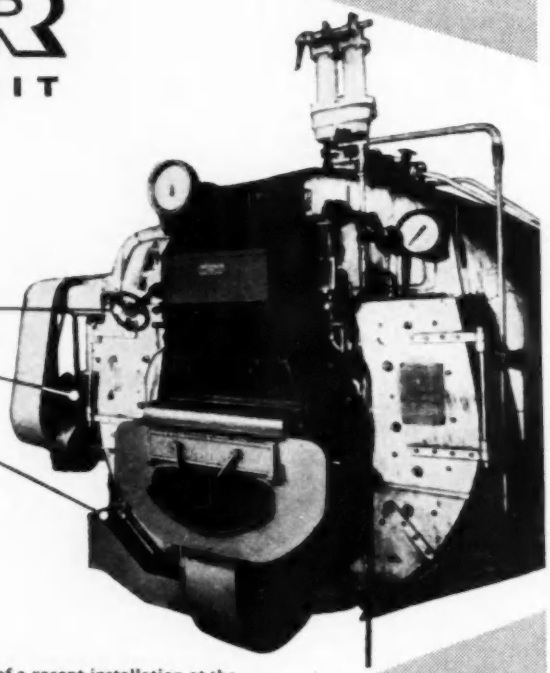
Low maintenance costs. No Stoker working parts. High Efficiency Self Cleaning Grates. Designed for Low Grade fuels.



Part of a recent installation at the St. Lawrence Hospital, Chepstow.

(Photograph by courtesy of the Hospital Authorities)

GUARANTEED

Smokeless combustion
Grit Free Operation
Full boiler rating.

CUT COSTS WITH

CROSTHWAITE

FORCED DRAUGHT FURNACES, AUTOMATIC STOKERS AND COAL & ASH HANDLING PLANT

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Conduct

A PLESSIFLEX application on the Bristol Bloodhound

Tough, flexible, seamless, all-metal PLESSIFLEX is the most thoroughly reliable means of conveying fuels and chemicals – whether they are gases or liquids, very hot or very cold, corrosive or inflammable – from one place to another. And this point is overwhelmingly endorsed by engineers in the aeronautical, nuclear, marine and chemical industries.

At pulsing pressures, at high pressures or under vacuum conditions, PLESSIFLEX provides the vital link between those parts in your installations which are subject to continual relative movement.

The basic components of PLESSIFLEX are the result of continuous development and testing, in consequence of which the complete hose units are unrivalled in their high quality. Offered in a range of sizes from ¼" to 2½" bore, and in almost any metal you care to name, PLESSIFLEX may be tailored to *your* particular requirements.

Suitably braided for stability, the tube itself is made from material that has been subjected to rigorous pre-process analysis – everything in fact about this versatile, incredibly robust product is shaped to the ends of higher performance and greater safety in fields where such requirements are essential.

Our engineers are waiting to show you how can solve your piping problems

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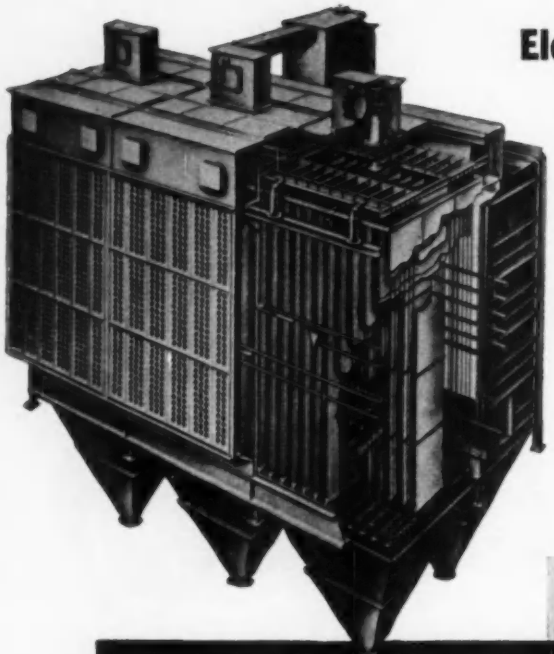
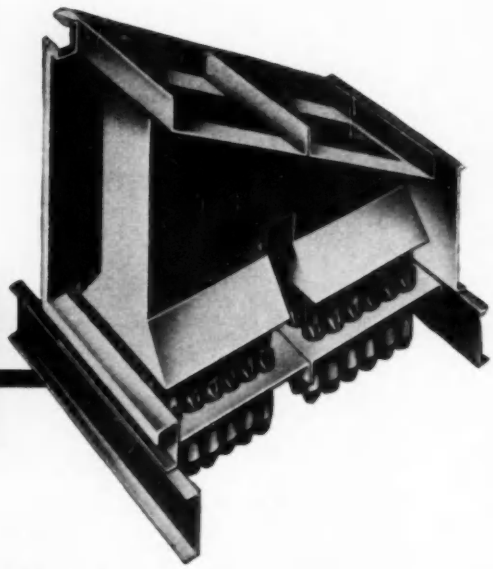


Electrostatic Precipitators

Made under licence from the Aerotec Corpn., U.S.A., these precipitators have an extremely high collection efficiency, low current consumption and many novel design features including screen-grid type collecting electrodes which minimise re-entrainment and consequent emission of dust. Manufactured in several combinations of width, height and length to suit available space in existing plants or most efficient usage of building volume in new constructions.

PD–KB



Multitubular Dust Collectors

Here is a dust collector which satisfies the ideal requirements of steam generator designers. It has a high collection efficiency at moderate resistance; maximum freedom from dust erosion; accessibility for maintenance and service; simple, low cost erection; flexibility of arrangement to meet space availability conditions. These collectors can be used in series with electrostatic precipitators and can be designed to match the precipitator inlet.

Induced & Forced Draught and Grit Arresting Fans

The product of over 75 years of experience, 'Tornado' induced and forced draught fans can handle any boiler draught requirements efficiently and reliably. The type A.R. aerofoil section backward bladed centrifugal fan, with peak efficiency of 90%, is only one of the many types (another is the combined induced draught and grit arrester) produced to deal with all classes of boilers from central heating to those in the largest power stations.

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in collaboration with Prat-Daniels (Stroud) Ltd., Whitecroft, Nailsworth, Gloucester

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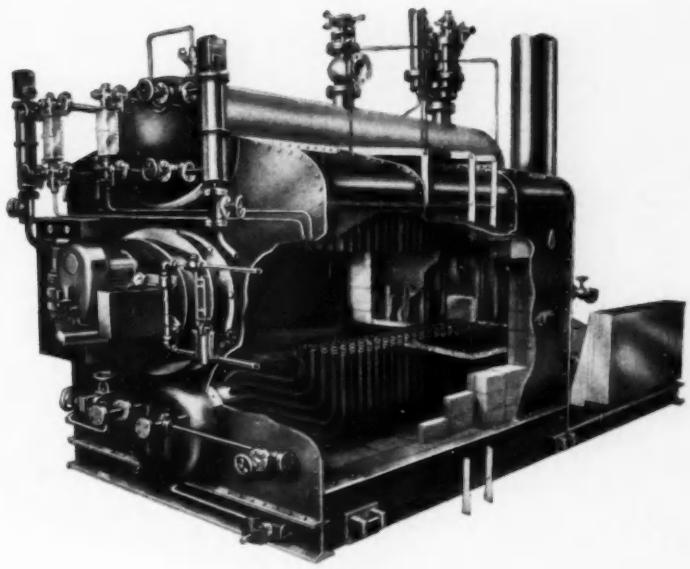
12 ADVANTAGES OF PAXMAN 'K' TYPE BOILERS

- Fully automatic control.
- Readily transportable and compact.
- High or low working pressure.
- Quick steaming to full output and rapid response to load fluctuation.
- High efficiency and economical operation.
- Fully steam tested before leaving our works.
- Inter-connected controls between forced draught and induced draught fans, resulting in balanced furnace pressure.
- Suitable for indoor and outdoor operation.
- Designed and built to appropriate British or overseas national insurance requirements.
- Low maintenance costs.
- Maximum degree of accessibility.
- Unique design permitting high overload conditions to handle your 'peaks'.



Plus *100 Years' Experience in Boiler Design*

Paxman 'K' type water tube boilers in a range of fourteen sizes offer evaporation ratings of 2,500 to 33,000 lb./hr. from and at 212°F. Sizes up to 17,000 lb./hr. are supplied as complete packaged units ; above this limit the boilers are delivered in semi-packaged form.

Each unit is provided with a fully automatic oil burner for use with heavy fuel oils having viscosities up to 3,500 seconds Redwood No. 1 at 100°F. Operating pressures range from 80 to 600 lb./sq. in. and integral superheaters can be incorporated if required.

Many boilers of this type are in use throughout the United Kingdom for steam generation and high pressure hot water systems.

For full details and illustrated literature, please write for one or both of the following publications: No. 1538 'K' Type Water Tube Boilers. No. 1515 Paxman Boilers.

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Colchester · England · Telephone : Colchester 5151 · *Telegrams: Paxman Colchester Telex · Telex No.:* 1875

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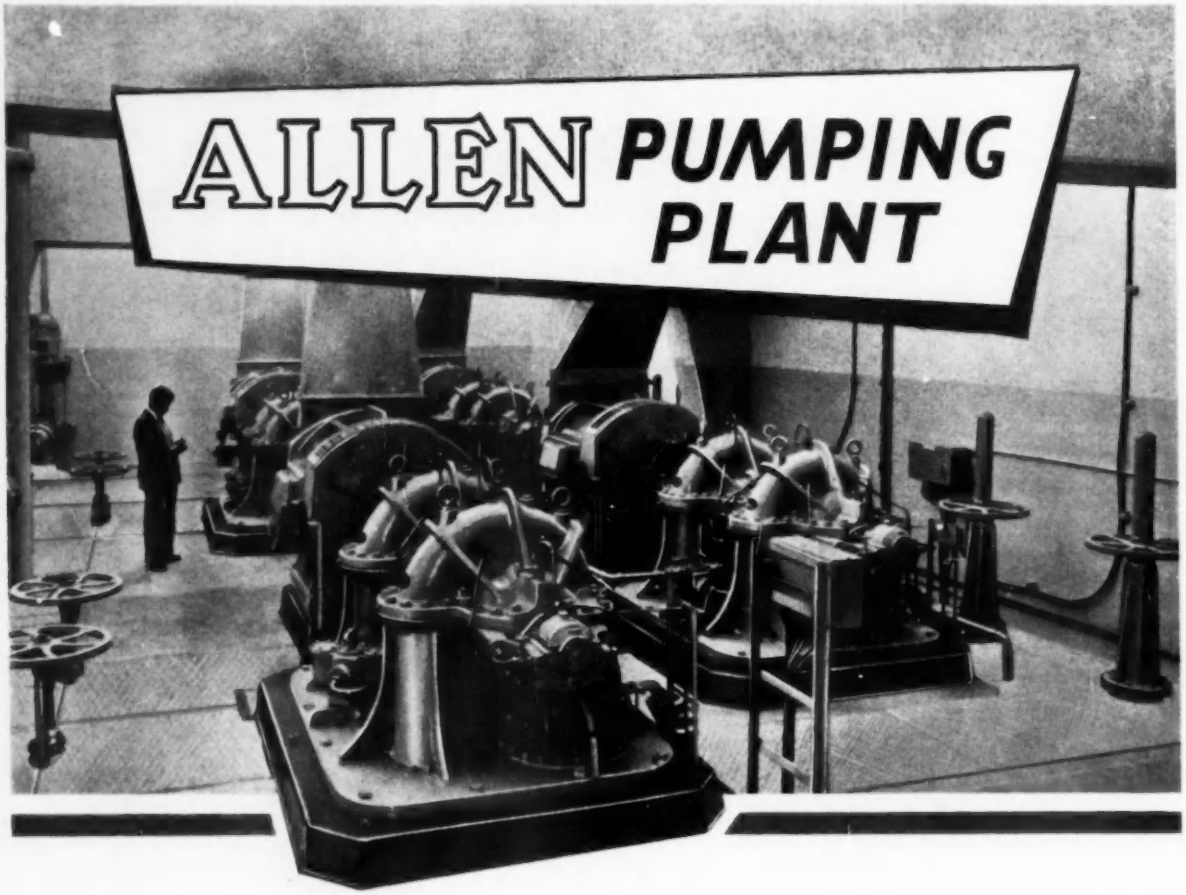

for Power Station Service

The plant illustrated is in service in the Electricity Supply Commission's Highveld Power Station, Orange Free State, South Africa.

It comprises four Allen horizontal double-suction, two-stage pumps with 20/16-in. branches, driven by 1245-h.p. M-V motors. Each pump is designed for a duty of 360,000 gallons per hour against a total head of 490 feet, running at a speed of 1485 r.p.m.

These pumps are typical of a large number of ALLEN units installed for power station and waterworks service.

***ALLEN** centrifugal, axial and mixed-flow pumps, horizontal or vertical, are designed to meet all requirements up to the largest capacity units needed in modern installations.*

Specialists in complete Pumping Plant Installations

W. H. ALLEN SONS & Co LTD BEDFORD

Valves over 2000 lb/sq.in pressure

Hopkinsons Limited have supplied, or have on order, valves for pressures above 2000 lb/sq. in. for the following installations

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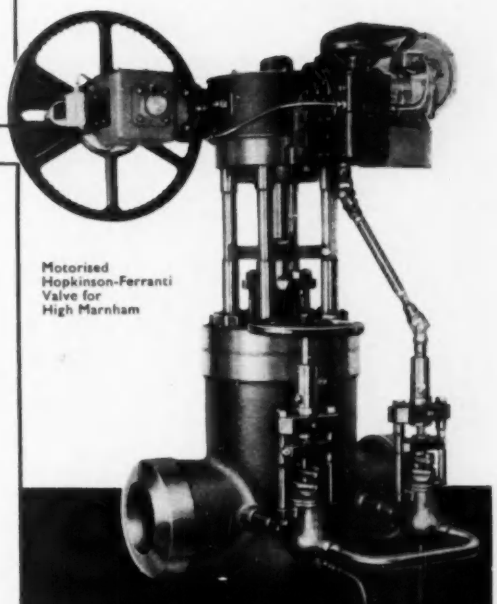
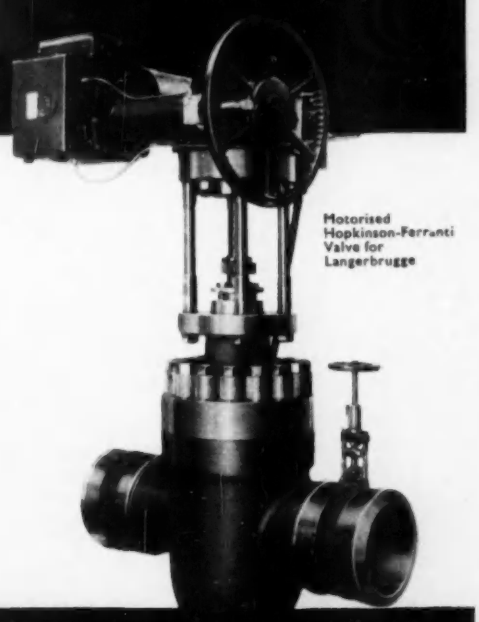
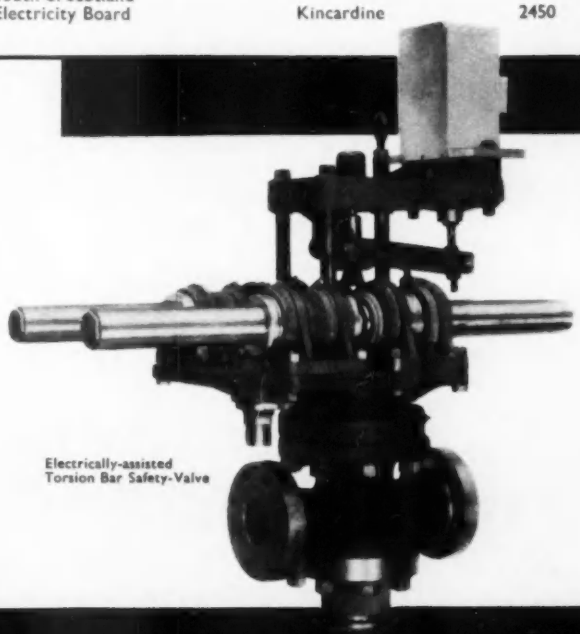
Central Electricity Generating Board	High Marnham	2450
Centrale Thermique Minière de l'Est de Charleroi, Belgium	Farciennes	2130
Electricité de France	Emile Huchet	2130
S.A. Charbonnages de Monceau-Fontaine, Belgium	Monceau-sur-Sambre	2160
Elec. Escaut, Belgium	Langerbrugge	2160
Steel Co. of Wales Ltd.	Margam	3150
South Zeeland Power Company, Denmark	Masnedø	2087
Central Electricity Generating Board	Thorpe Marsh	2450
Soc. Meridional di Elettricita	Naples	2558
Electricity Commission of New South Wales	Vales Point	2450
Central Electricity Generating Board	Blyth 'B'	2450
South of Scotland Electricity Board	Kincardine	2450



Motorised Hopkinson-Ferranti Valve for High Marnham



Motorised Hopkinson-Ferranti Valve for Langerbrugge



Electrically-assisted Torsion Bar Safety-Valve

HOPKINSONS LIMITED · HUDDERSFIELD

LONDON OFFICE: 34 NORFOLK STREET, STRAND W.C.2.

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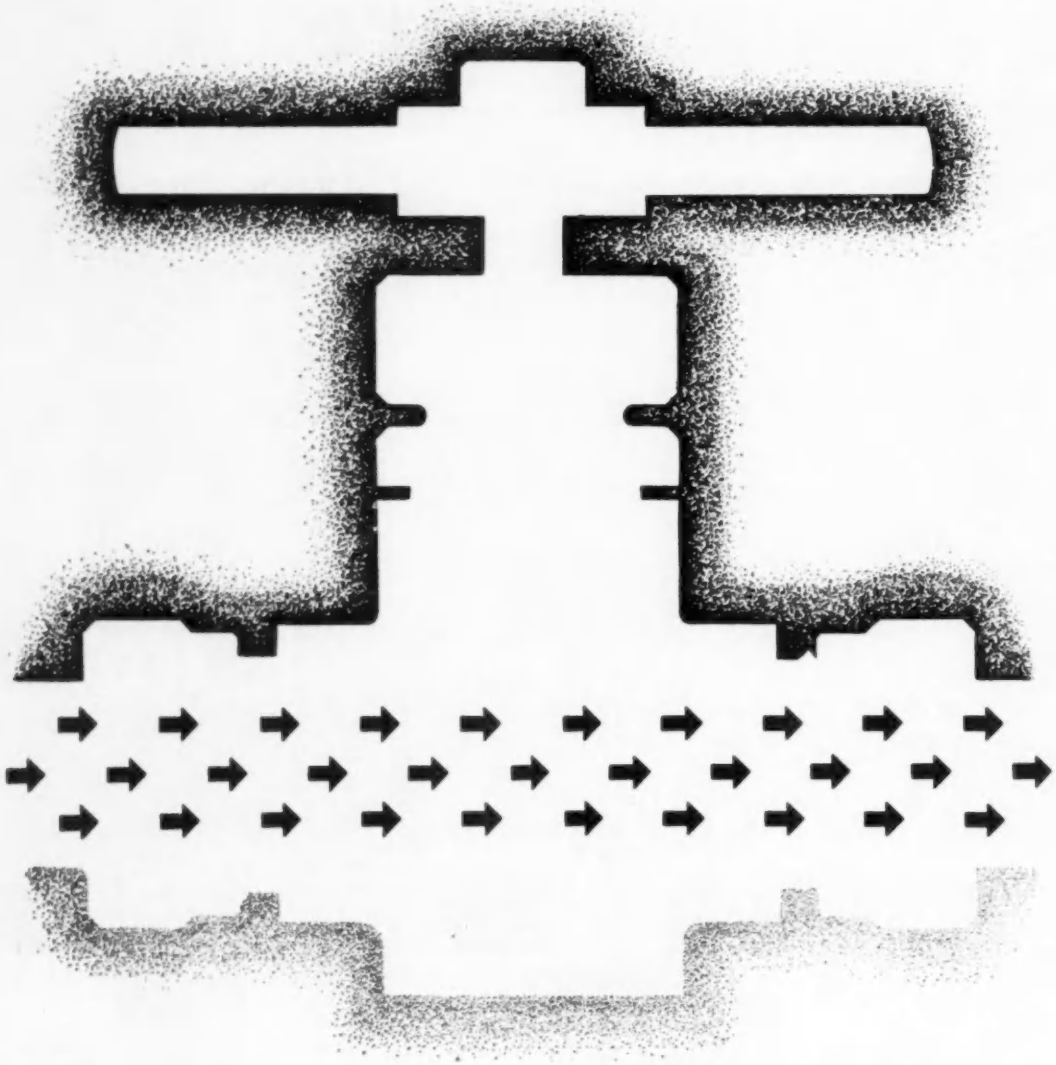
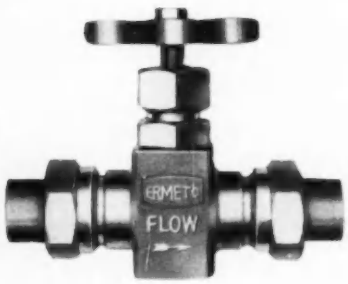


in connection with high pressure

ERMETO VALVES, incorporating the famous **ERMETO** High Pressure Couplings are designed for use with a wide range of fluids, and are tested to one and a half times the recommended working pressure. They are available with standard Ermeto end connections. Non-standard valves can be made by special arrangement. Technical advice and fully illustrated catalogue will be supplied on request.



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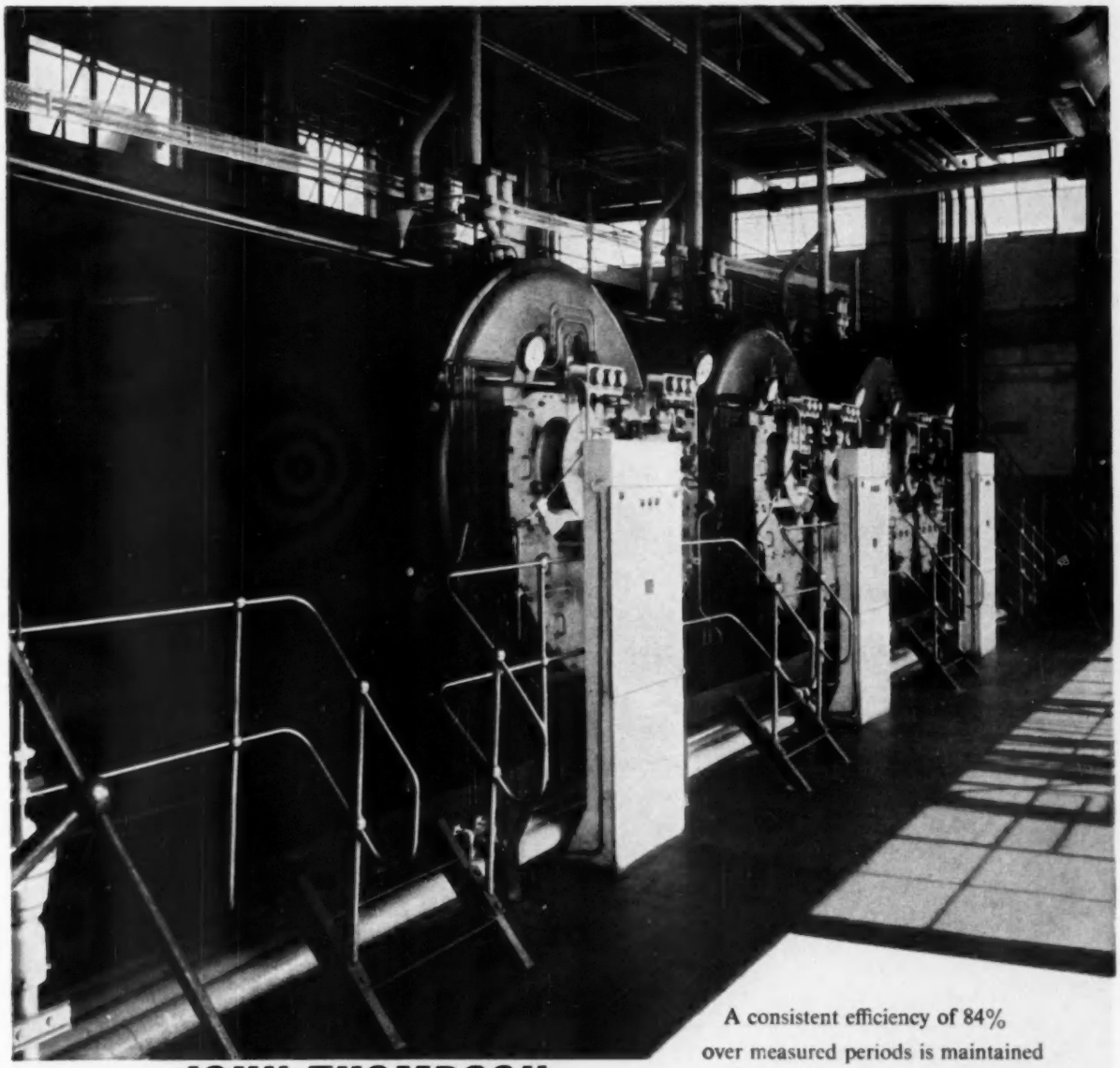

JOHN THOMPSON SUPER ECONOMIC BOILERS at MULLARD Simonstone Works

A consistent efficiency of 84% over measured periods is maintained by these three Super Economic Boilers which provide high pressure hot water at 250°F and 120 p.s.i. at Mullard Simonstone Works. All are oil fired, with a rating of 9250 lb/hr, the third boiler being a standby. Steel chimneys for the installation were made and erected by John Thompson (Dudley) Ltd.

JOHN THOMPSON GROUP

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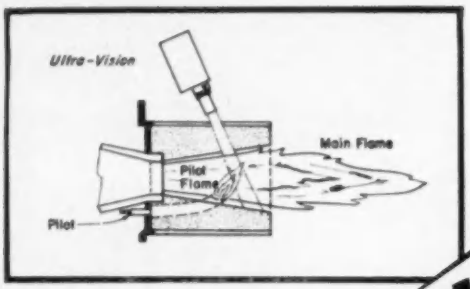

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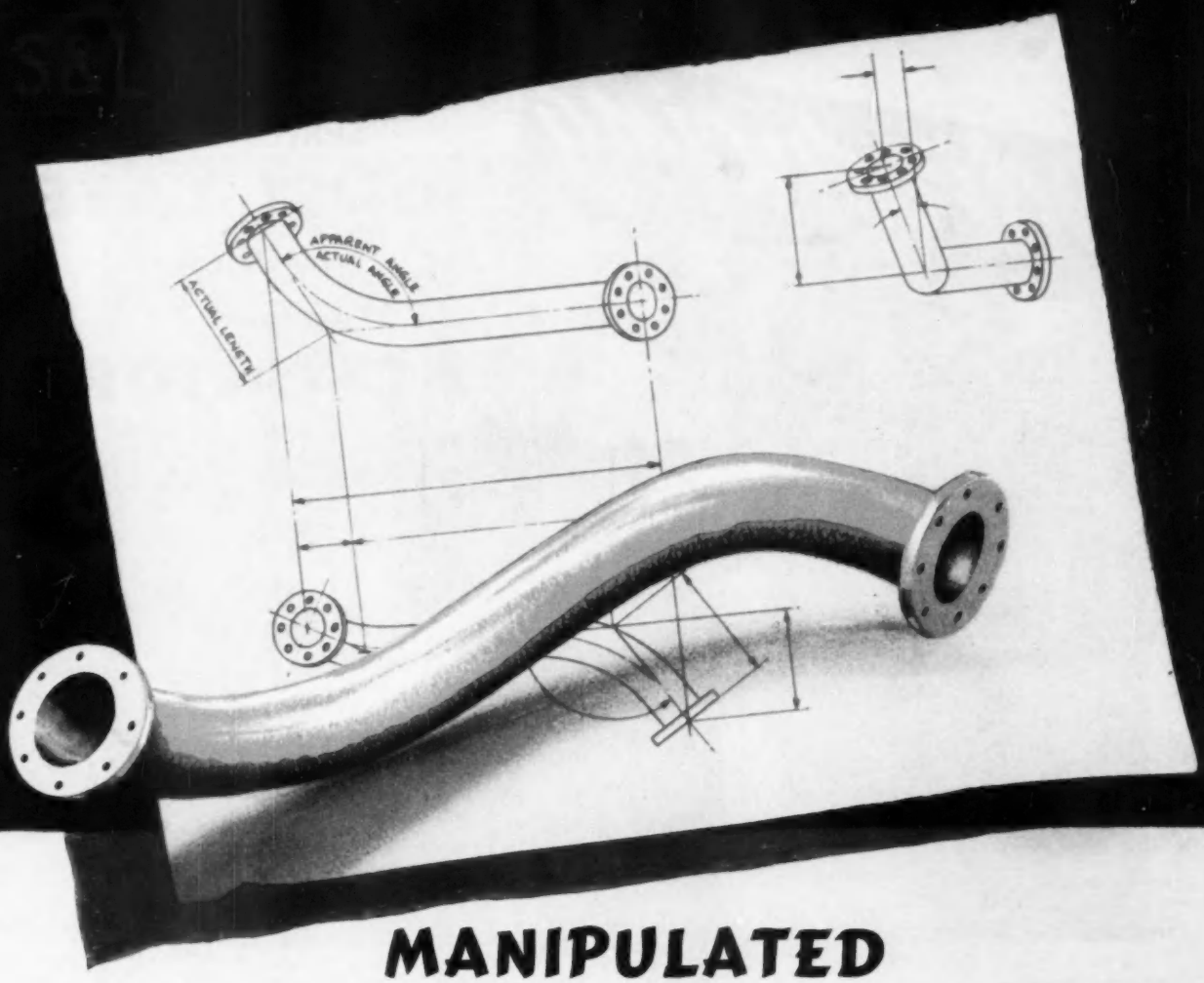

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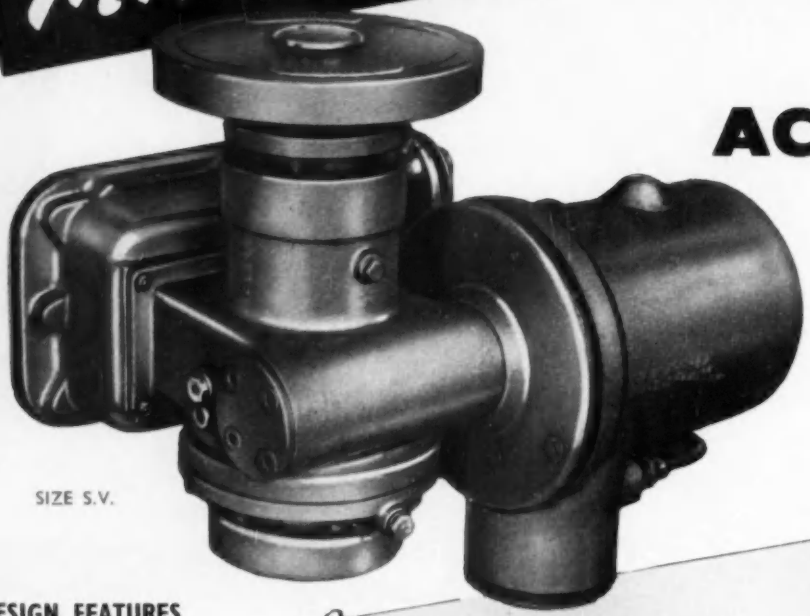

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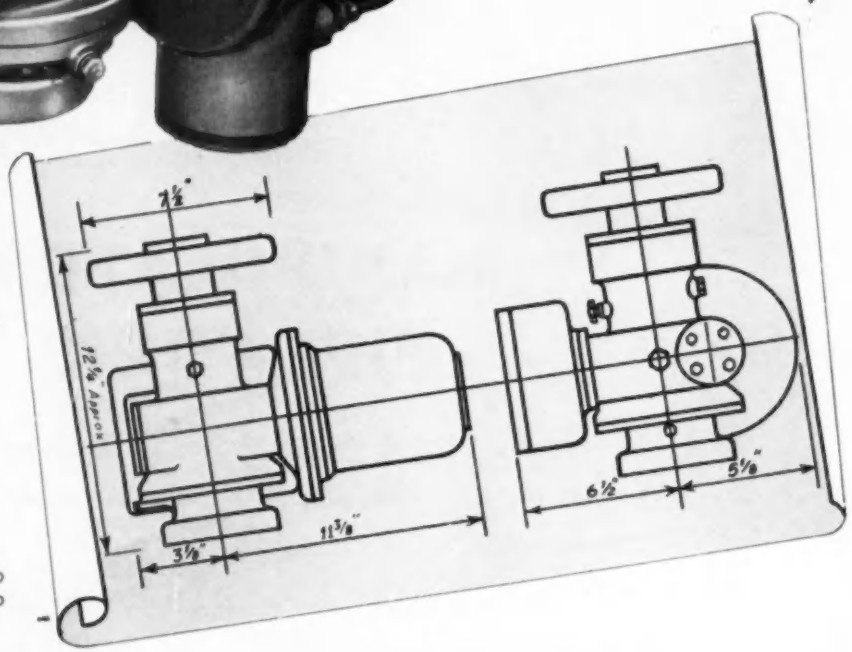

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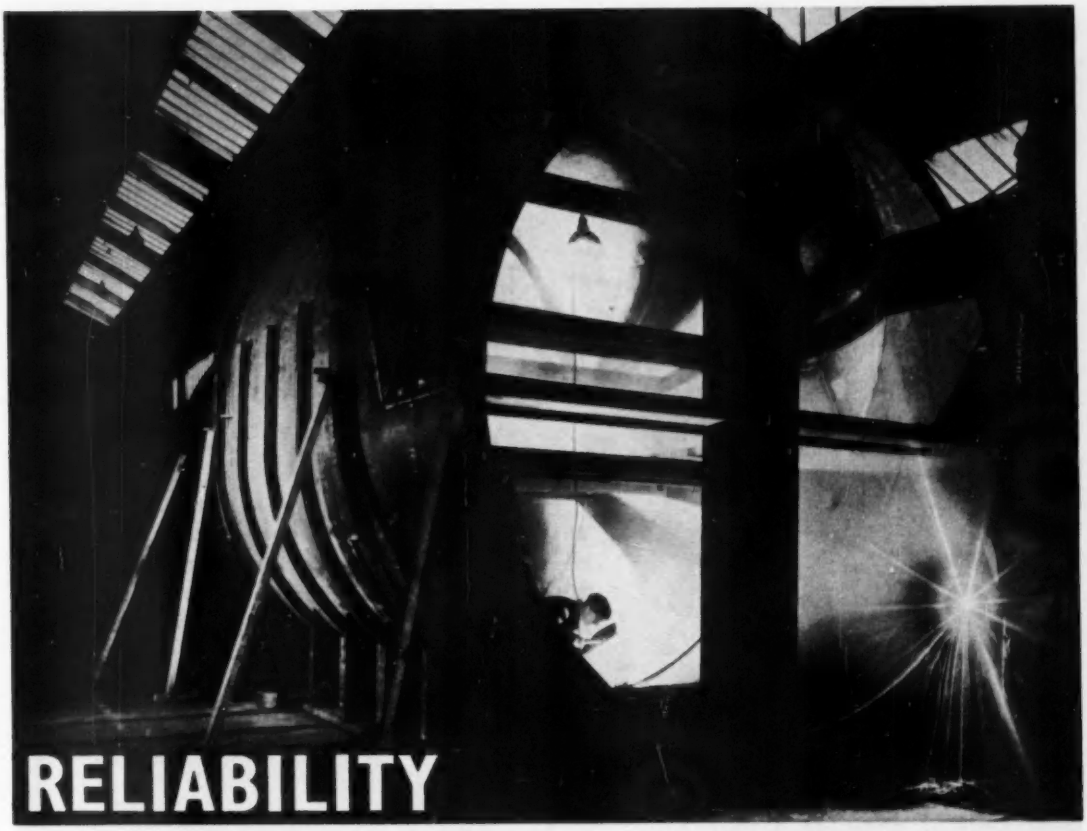

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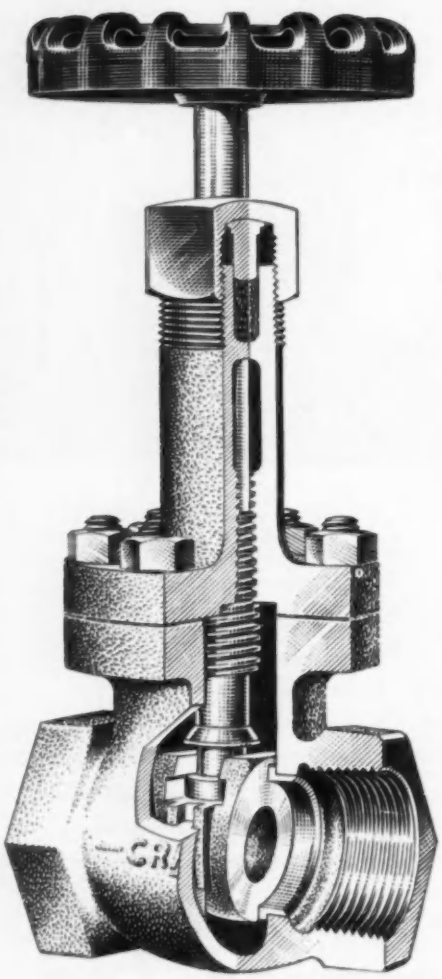

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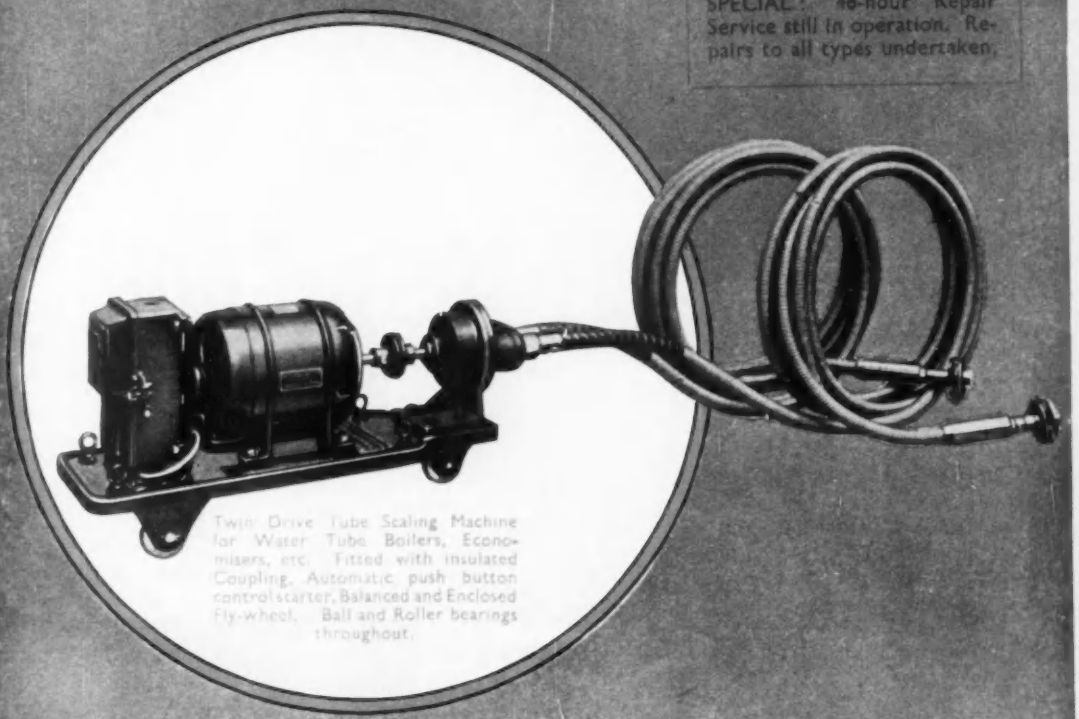

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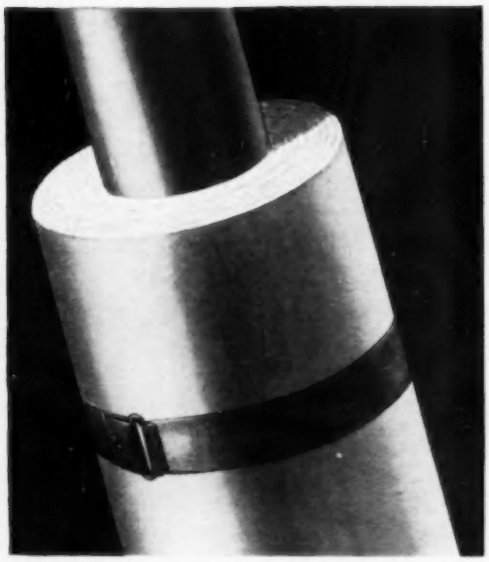

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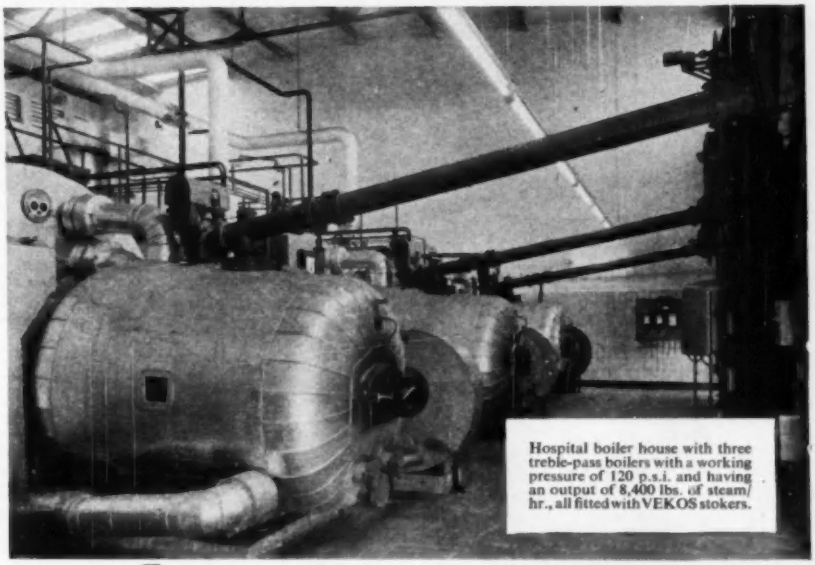

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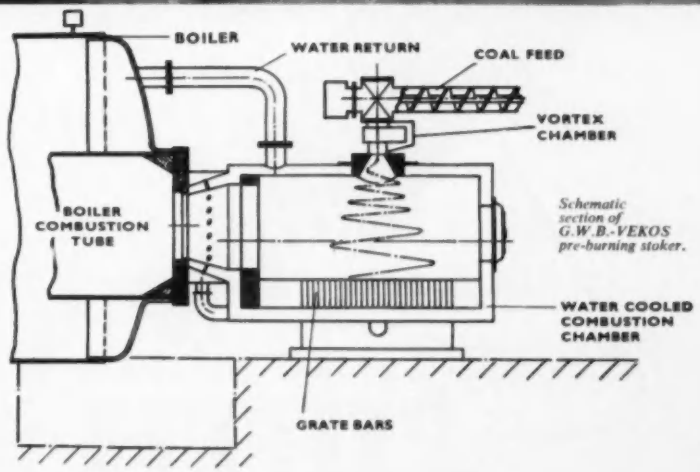

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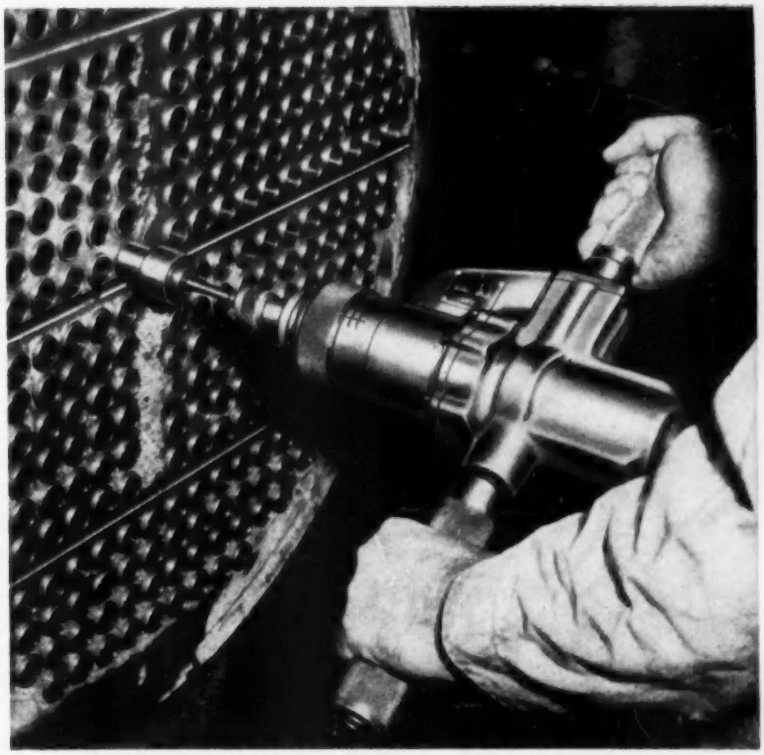

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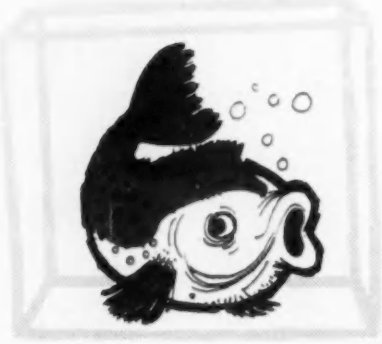

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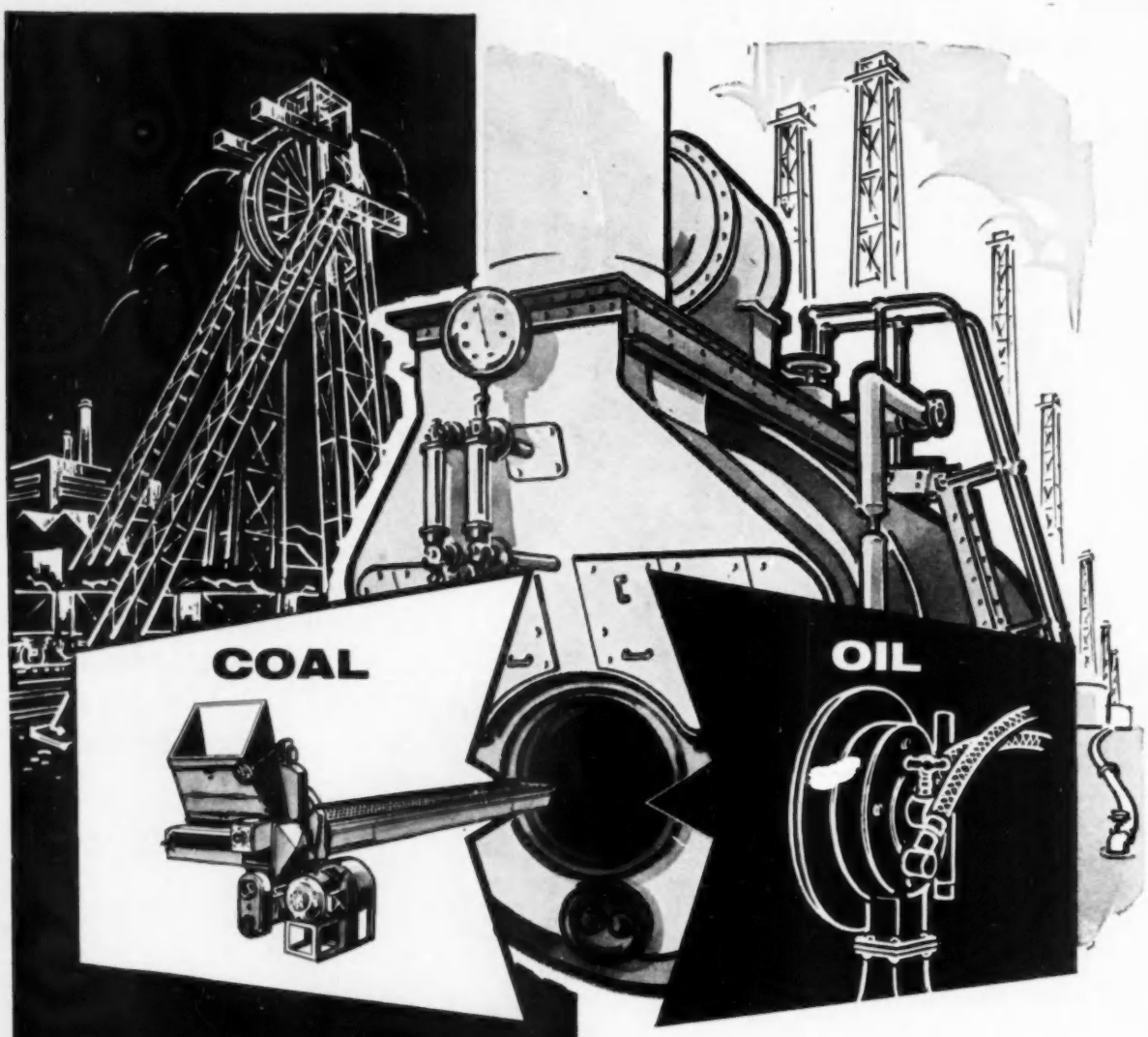

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JANUARY 1960

VOLUME 75. No. 1

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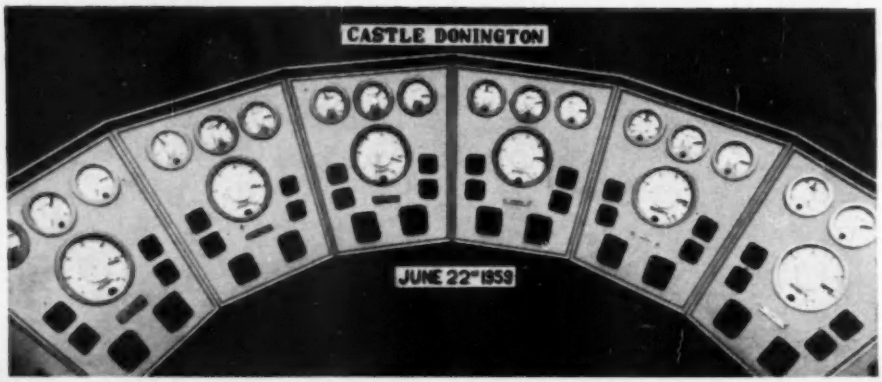

Right: Photograph showing megawattmeters at Castle Donington in June 1959, registering unit outputs of approximately 102, 100, 102, 99, 98, 99 megawatts.

102 100 102 99 98 99

MEGAWATTS

WITH all its six 830,000 lb./hr. Babcock Radiant boilers on full load by June 1959, Castle Donington power station (C.E.G.B. East Midlands Division) was the first British station with 100 MW boiler/turbine units to come into full operation.

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POWER DEVELOPMENT PROSPECTS

NUMEROUS experts have expressed the opinion that the year 1960 could mark something of a technical and economic break through. In any case, the outstanding technical and scientific changes which have taken place since the war are now lining up with the noticeable improvement in the economic outlook which started in 1958 with a gradual but certain recovery which resulted in a boom in a wide range of consumer goods, and which has subsequently led up to a strong recovery in capital goods. This country is well placed to take full advantage of the present situation:—employment is full, although not overfull. In some industries in which new development schemes have recently been completed, there is perhaps a certain amount of so-far unused capacity, but the amount is not large. The demand for fuel, power, iron and steel is increasing, as is the industrial demand for machine tools and manufacturing machinery in general. But looking back, many people regard 1958 and not 1959, as by far the best of recent years—particularly so far as the engineering industry was concerned—for although 1959 was an eventful one for engineers, it was not so much so as 1958, in which year so much of engineering interest was achieved. Whether 1960 will show a greater advance than 1959 is something which remains to be seen; but indications are that output in the engineering industries will increase still further. Statistics show that although the output of the steel industry fell well below capacity during 1959, the industry was operating at 95 per cent. during the last few weeks of the year.

The past year provided outstanding evidence of the continued progress in the electrical power generating industry, as it marked the end of a decade during which the total installed generating capacity in this country has increased by some 11,450-MW ; viz. from 13,784-MW in 1950 to 25,231-MW in 1959. The amount of electricity sold has risen from 46,000 million to approximately 90,000 million kWh per annum. If this rate of progress continues, and there is every indication that it will do so, the demand for electricity will again be doubled during the next ten years. In 1950 new generating plant was being commissioned at the rate of about 1,000-MW a year, mainly comprising standard 30-MW sets with a few 60-MW machines. Last year there were commissioned further machines of 100-MW and 120-MW capacity, while the first 200-MW steam power generating set ever to be installed in this country was started up at High Marnham. But of still greater significance is the fact that there are on order, units of 200-MW, 275-MW, 300-MW, 350-MW and 550-MW capacity—all, of course, with unit boilers. Each of these sets will, it is claimed, generate electricity considerably more cheaply than the existing sets, and at a considerably cheaper figure than that counted upon as possible by the advocates of nuclear power, when the nuclear power station programme was announced and planned in February, 1955.

Although 1959 was perhaps not a particularly spectacular year in the field of nuclear power, a considerable amount of progress was made and further development took place. Chapelcross nuclear power station was officially opened on May 2nd (although the first reactor came into operation at the end of 1958), the second was commissioned some months ago, the third on December 7th, and the fourth and last became critical on December 27th. It is of interest, however, to note that, as at Calder, these reactors are producing power considerably in excess of the designed output. Calder's output of electricity to the National Grid now exceeds 1,500 million units, and that from Chapelcross to date, more than 200 million units. On November 14th, the advanced fast reactor at Dounreay went critical (some months later than originally planned), and the lengthy programme of operational experimentation designed to evaluate the potentialities of the system then began. As is generally known, this fast breeder reactor employs liquid sodium-potassium as the coolant, and has a thorium blanket around the reactor core in which new reactive material will breed. Many months are likely to pass before it reaches full power, and furthermore, there are numerous problems to be solved before any purely commercial station can be constructed to operate on this system. Nevertheless, when brought up to the full design power of 60-MW (t) the Dounreay reactor will represent the largest fast system in the world at present.

The construction of the first three nuclear power stations for the C.E.G.B. at Bradwell, Berkeley, and Hinkley Point respectively, has progressed steadily during the year—the first large reactor pressure-vessels at the two first-named stations have now been pressure tested. At Hinkley Point, after nearly two years' work, the two reactor buildings are now complete.

Tenders for the new 500-MW station at Trawsfynydd in North Wales were examined by the Central Electricity Generating Board, and the Atomic Energy Authority acting as their consultants for the reactors, and a contract was awarded to Atomic Power Constructions Ltd., who commenced work on site last summer. The projected Dungeness station is likely to have an output within the range 500-MW to 550-MW and the Sizewell station in Suffolk may be of similar capacity. The site for this station is still subject to permission being granted by the Local Planning Authority and the Minister of Power.

Points and Pointers

COLLABORATION IN FUSION RESEARCH The United Kingdom and Euratom agreed on December 4th that it was desirable to organise and develop close collaboration in the study of controlled thermonuclear reactions (fusion) for peaceful purposes, including exchange of personnel and comparison of programmes, with the object of avoiding unnecessary duplication of effort. The first meeting of the Continuing Committee for Co-operation discussed the progress made since the signing of the United Kingdom-Euratom agreement on February 4th, 1959. The committee considered suggestions for co-operation between the Commission and the Authority on fast breeder reactor techniques. The advanced gas-cooled reactor system was also discussed and it was agreed that a preliminary technical meeting should be held this month. The committee agreed on these proposals for further co-operation in the peaceful uses of atomic energy, after hearing a report of the work already accomplished at the technical level by the Joint Working Group (which consists of officials of the two organisations). The group was asked to pursue its work with a view to the continued development of close and fruitful relations between the two sides. The community was represented at the meeting by M. Etienne Hirsch, President of the Euratom Commission, and M. Emmanuel Sassen, a member of the commission. Lord Hailsham, Lord Privy Seal and Minister for Science, and Lord Plowden, chairman of the Atomic Energy Authority, represented the United Kingdom. The Euratom representatives visited the Central Electricity Generating Board's nuclear power station at Bradwell, and the Atomic Energy Research Establishment, Harwell. President Hirsch and M. Sassen called on Mr. Selwyn Lloyd at the Foreign Office on the afternoon of December 3rd.

SMOKELESS FUELS The major impact of the Clean Air Act on demand for smokeless fuel should be felt from 1965 on. The National Coal Board's investment in plant to provide suitable smokeless solid fuels will be at least £10 million and may be £20 million. Dr. J. Bronowski, director-general of the N.C.B.'s process development department, giving this information at the recent Coal Industry Society luncheon, explained that in four years there had been a 70 per cent. rise in the sale of premium smokeless solid fuels. This is a greater rise than in the sale of household oil. The basic requirements for the new solid fuels was that they should be convenient to handle and store, should ignite easily, burn brightly and long, and pick up well when the fire is made up. Finally, they must leave only a little, non-dirt creating ash. This may sound an impossible specification but Dr. Bronowski said that N.C.B. scientists have produced such fuels at Stoke Orchard, near Cheltenham, and produced them from coal of a kind now abundantly available. Pilot plants are now being built as the next step towards commercial-scale production. The Board's plans were not confined to one fuel or one process. They intended to prove the new processes technically and commercially before 1965. This would require an annual rate of production of at least one million tons of new fuel well before that year. Total production by 1965 and beyond would depend on the market, but the Board would be ready to expand as rapidly as the market justified.

STEEL DEVELOPMENT The Steel Company of Wales Limited recently announced a further plan of development which is designed to increase its annual production of ingot steel to 3,650,000 tons by the end of 1961, with consequent increases in sheet and tinplate production. This plan, the cost of which is estimated at about £30 million, is additional to the company's third development programme, work under which is now approaching completion. The new plan does not include any further additions to coke ovens, blast furnaces or steel-melting shops but certain modifications will be made, in the light of experience already gained, to give increased efficiency and performance. A continuous casting plant is to be installed for the production of steel slabs, and a 48-in. wide hot strip mill is to be built alongside the existing 80-in. hot strip mill. This, the company says, is an arrangement which will give greater flexibility as well as a measure of reserve capacity. By this new arrangement, it will be possible to roll on the wide mill, additional quantities of the sheet required for special purposes, and to utilise the narrower mill for the production of steel coil for tinplating as well as for other purposes. The new 48-in. mill, it is stated, is likely to be manufactured in Scotland. Additional finishing equipment is to be installed in the Abbey Works to deal with the increased output of steel sheet. The new plan, it should be noted, has been approved by the board of The Steel Company of Wales Limited; it has now gone to the Iron and Steel Board for approval. A further programme of steel plant development, involving an expenditure of £10 million, has been announced by The United Steel Companies Limited. The existing open-hearth melting furnaces at the Rotherham plant of Steel, Peech and Tozer, are to be replaced by six electric-arc furnaces, each of 110-ton capacity. When this project is completed in about five years' time, the claim is that it will be the largest electric steel-making plant in the world, with an annual capacity of 1,350,000 ingot tons. At present, there are twenty-one open-hearth furnaces in the Steel, Peech and Tozer works—fourteen at Templeborough and seven in the Rotherham melting shop—producing 1,000,000 ingot tons a year. The existing Templeborough melting shop is to be adapted to house the new electric furnaces. The Rotherham melting shop is to be demolished. Initially, four swing-roof electric furnaces will be installed, and it is planned to have the first of them in commission by the beginning of 1963. In order to make a start on the plant, however, the first two open-hearth furnaces at the Sheffield end of the Templeborough melting shop will close down in two years' time, to be followed by others as the scheme progresses.

Arrangements have been made to maintain the present level of steel production during the change-over by fitting double oil-burners to some of the furnaces, and converting others to all-basic refractory linings. The changeover from the open hearth to the electric arc process will entail the provision of new steam generating equipment as all the existing waste heat boilers will become redundant. Special attention will be given to fume extraction equipment with the aim of minimising the dust nuisance. A new ingot mould preparation building is to be laid down adjacent to the melting shop, and this will be twice the size of the existing mould preparation building, which it will replace.

ZENITH STARTS OPERATING The Zenith reactor at the Atomic Energy Establishment, Winfrith, Dorset, started operation for the first time at 5.30 a.m. on December 19th, and the final stages of commissioning the plant will be carried out during the next few months. Zenith, which is the first reactor to be built at the United Kingdom Atomic Energy Authority's establishment at Winfrith, will be first used by the international staff of the O.E.E.C. high-temperature reactor project to establish design characteristics for a 20-MW high-temperature gas-cooled reactor experiment called Dragon which is to be built at Winfrith. The O.E.E.C. high-temperature reactor project (Dragon) is a joint undertaking by the United Kingdom, Austria, Denmark, Norway, Sweden, Switzerland and the European Atomic Energy Community, Euratom, (Belgium, France, Italy, Luxembourg, The Netherlands and West Germany). The agreement provides for a joint research and development project, over a five-year period from April 1st, 1959, to design, construct and operate a high-temperature gas-cooled reactor experiment; the project has its headquarters in the United Kingdom at the Atomic Energy Establishment, Winfrith, Dorset. An Authority team was responsible for the basic conception of Zenith, for the approval of contractors' designs and for the inspection and commissioning of the plant. The fuel elements and nucleonic instrumentation were designed and produced by the Authority. The main contractors for the reactor were the General Electric Company, Atomic Energy Division, Erith. As mentioned in our description of Zenith, published in the September, 1959 issue of this journal, the reactor has been built to operate under temperature conditions similar to those expected in a high-temperature gas-cooled power reactor. The reactor core consists of a nearly cylindrical assembly of 235 fuel elements, 8-ft. high and 4-ft. in diameter, in the form of graphite cylinders, containing pellets of fissile uranium oxide, fertile thorium oxide and graphite, arranged in regular patterns, and is enclosed in a pressure-vessel through which the nitrogen gas is pumped in a continuous closed circuit. The nitrogen is heated by a 200-kW heater as it enters at the bottom of the core: the hot gas raises the core mean temperature to 800 deg. C. At the top of the core the hot nitrogen is mixed with cooler gas before passing through the reflector: thus the reflector is kept at a mean temperature of 400 deg. C. At the operating temperatures it is most important to maintain the purity of the nitrogen and a purification system is used to remove traces of carbon monoxide and carbon dioxide.

CHEMICAL ENGINEERING AT CAMBRIDGE The department of chemical engineering at Cambridge University has officially moved into its new building, opened by Lord Godber, chairman of the Shell group of companies, on December 9th. During his address, Lord Godber recalled that some twenty years ago, he and his company had realised that the derth of chemical engineers in the country was such as to be a national weakness that would be disastrous if not corrected. At the end of the war Shell offered Cambridge a gift of £435,000 to found a school of chemical engineering. The gift was accepted, and supplemented by an annual grant of £3,000 a year as the basis of the Shell Chemical Engineering Studies Fund. The department initiated a new form of engineering education. The student entry was taken from men who had already completed Part 1 of the natural science tripos in chemistry or of the mechanical science tripos. From the outset, the department has provided a course suited to both groups, avoiding any attempt to mould them into a single pattern; the object has been to modify both and let them temper each other. As the Vice-Principal, Professor H. Butterfield explained, when introducing Lord Godber, stress in the department's teaching had always been on fundamentals, aimed at encouraging an original approach. He also acknowledged the importance of the private benefactor to the university in these days. During their final year, students undertake a modest research project rather than formal laboratory experiments and some information of genuine value has been obtained in this way. To date, the Shell Fund has made grants to 54 students taking the chemical engineering tripos, and two others have been supported by a parallel contribution from Esso. Post-graduate research has steadily increased and so far, 21 students have submitted work for higher degrees.

THE NUCLEAR POWER GROUP During August last, it was announced that negotiations were in progress between The Nuclear Power Plant Co. Ltd., and the A.E.I.-John Thompson Nuclear Energy Co. Ltd., with a view to arranging collaboration between the two companies on nuclear matters. Since then, it has been agreed that the two companies become partners on an equal basis in all respects as from January 1st, 1960, under the name of The Nuclear Power Group. The head office of the Group is at Radbroke Hall, Knutsford, Cheshire. The constituent members of The N.P.G. are:—Associated Electrical Industries Limited; Clarke, Chapman and Co. Ltd.; Alex. Findlay and Co. Ltd.; Head, Wrightson and Co. Ltd.; Sir Robert McAlpine and Sons Ltd.; C. A. Parsons and Co. Ltd.; A. Reyrolle and Co. Ltd.; Strachan and Henshaw Limited; John Thompson Limited; and Whessoe Limited. Each partner has three representatives on the Group Board. The primary objects of The N.P.G. are:—(1) To assist the partner companies to complete Berkeley, Bradwell and Latina nuclear power stations. (2) The design, development and sale of nuclear reactors of all kinds. (3) The construction of complete nuclear power stations at home and abroad. (4) The construction of nuclear units for ship propulsion. (5) The supply of components, etc., peculiar thereto, and (6) research and development in matters concerning nuclear energy.

Dry Cooling-Tower Condensing Plant

THE loss of cooling-water by evaporation, which takes place in conventional cooling-towers, has been eliminated in a "dry cooling-tower" system based on work carried out by Professor L. Heller and Mr. L. Forgo, of Budapest. In the new system, turbine exhaust steam is condensed in a spray-condenser, using feedwater in a closed-circuit, the final heat rejection to atmosphere taking place in heat-exchangers, or coolers, of a patented design. The principle is new in cooling-tower design, in that it does away with the need for make-up water, and if successfully adapted to large-scale operation could mean that in future, generating stations will no longer have to be built where adequate supplies of water are available.

Since details of the system were first outlined by Professor L. Heller and Mr. L. Forgo, of Budapest, at the 1956 World Power Conference in Vienna, work on a small scale has been carried out by the Hungarians. The development work necessary to incorporate the system in large power stations is, however, being undertaken in Great Britain by The English Electric Co. Ltd., and in order that operational experience could be gained with the minimum of delay, the Central Electricity Generating Board decided to apply the system to one of the 120-MW turbo-alternator sets being installed at the new Rugeley power station in the Midlands Division.

Two basic types of dry cooling-tower plant are envisaged, induced-draught or natural-draught; but in either case the principle is the same. Cooling-water of condensate purity is sprayed into the condenser to condense the exhaust steam, the mixture of condensate and cooling-water then being withdrawn from the condenser by means of an extraction pump. A proportion of this water passes through the feedheating system back to the boiler in the usual manner, the remainder entering the specially-designed heat-exchangers situated around the base of the tower. Air flowing through these heat-exchangers cools the water, which then passes through a water-turbine, back to the condenser jets.

To ensure the absence of any air-leakage into the cooling-system, the pressure is maintained above atmospheric at points beyond the extraction pump. This results in a greater difference in head between the top of the cooler and the condenser than would be necessary if the pressure was sub-atmospheric beyond the extraction pump. It is in order to recover some 90 per cent. of this excess head that a water-turbine is incorporated. The turbine is usually direct-coupled to either the extraction-pump or extraction-pump motor, and is of the spiral-casing Francis-type. Fig. 1 shows a static-head diagram for a typical 120-MW dry cooling-tower installation.

Details of the cooler elements, upon which the successful operation of the system depends, are shown in Figs. 3 and 4. The coolers are constructed entirely of aluminium, and are built up of a number of standard elements each 16-ft. high by 8-ft. wide, and containing up to eight rows of tubes, each row comprising 40 tubes. Slotted aluminium strips are threaded on to the aluminium tubes, and held apart by circular collars. To ensure a high rate of heat transfer between the strips and the tubes, it is essential to have a tight contact between these surfaces. This is achieved by expanding the tubes into the collars while pressure is applied longitudinally to the collars and strips by means of endplates; the tubes being finally expanded into the endplate, with no soldering, brazing or welding being necessary.

Irrespective of whether the cooling elements are used in forced-draught or natural-draught cooling tower designs, the overall efficiency of the new system will depend upon the achievement of good heat transfer with small temperature differences and small pressure losses on the air side of the cooler element. A heat transfer coefficient of 80-120 kcal per square metre-hour-deg. C. is claimed for strip-finned surfaces of the kind visualised here. The purpose of the slots is to inhibit the boundary layer that would build up with an air flow along an equivalent plane surface and would reduce the heat transfer per unit area.

The arrangement of elements which make up the cooler will of, course, depend on whether an induced

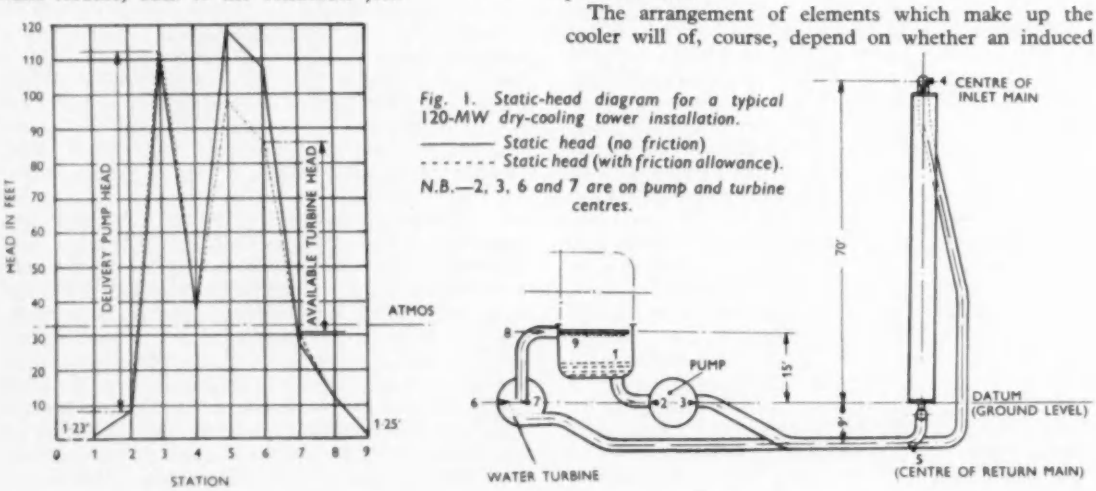


Fig. 1. Static-head diagram for a typical 120-MW dry-cooling tower installation.

——— *Static head (no friction)*

- - - - - - - *Static head (with friction allowance).*

N.B.—2, 3, 6 and 7 are on pump and turbine centres.

or natural-draught plant is being installed. At Rugeley, for example, the tower is of the natural-draught type. It will be 350-ft. high, 326-ft. dia. at the base, and 216-ft. dia. at the top, and the elements will comprise six rows of tubes mounted in columns of three, one above the other, giving a cooler height of 48-ft. These columns will be mounted in pairs, set at an angle of 60° to each other,

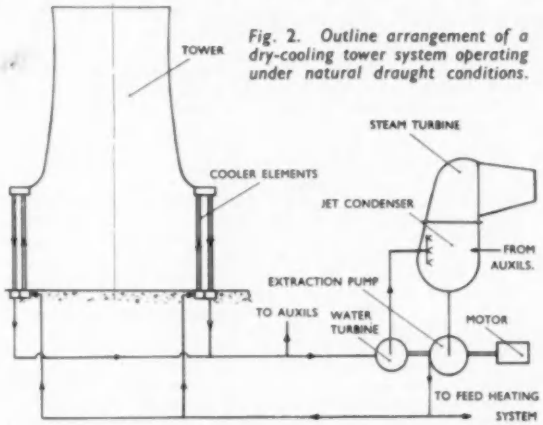


Fig. 2. Outline arrangement of a dry-cooling tower system operating under natural draught conditions.

around the base of the tower. A total of 648 elements will be required, and this will involve the use of approximately 434-tons of aluminium. Smaller sets, of say, 5-MW capacity, would normally utilise induced-draught, in which case the cooler would be made up of four-row elements in single columns, 16-ft. high. The cooling system for the tower at Rugeley will be filled with 1,700-

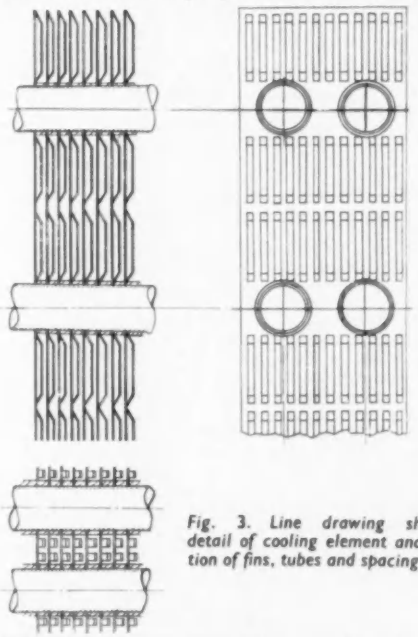


Fig. 3. Line drawing showing detail of cooling element and position of fins, tubes and spacing rings.

tons of distilled water, and when in operation there will be 62,000 gal./min. flowing through the cooling elements, with the addition of 1,200 gal./min. returning to the boiler.

A schematic arrangement of a dry cooling-tower condensing plant using natural draught is shown in Fig. 2, and it can be seen that in this example both the water inlet and outlet are at the base of the cooler, giving a two-directional flow. A single-pass may, however, be used, with the water entering at the top of the coolers. The static head diagram, Fig. 1, has, in fact, been based on an arrangement of this type.

To facilitate maintenance, and as a safeguard against freezing, the coolers are divided into sections, each of which can be drained, the water flowing by gravity to a tank placed within the base area of the cooling tower. The arrangement of the coolers in sections could also be useful when the plant is operating on part-load. With an induced-draught plant, however, multi-speed fans would be installed, and under part-load conditions they could operate at a reduced speed.

Two advantages are claimed for the spray condenser used in the dry cooling-tower system. In the first place, the temperature drop experienced with tubular condensers is avoided, and thus an improved vacuum is achieved. Secondly, this type of unit requires considerably less basement depth, with a consequent saving in civil engineering costs.

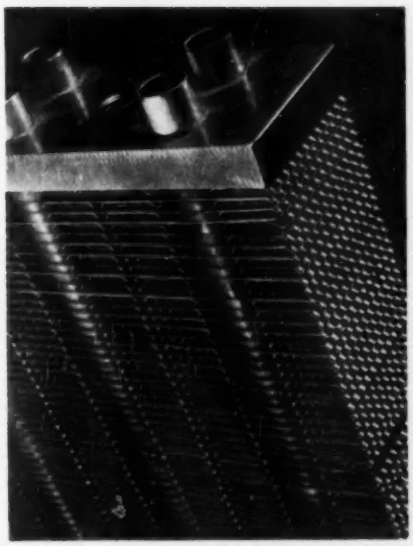


Fig. 4. Close-up showing details of two-row cooler-elements.

The steel condenser shell is arranged for bolting direct to the turbine exhaust flange, being supported by adjustable spring feet which accommodate expansion, together with expansion pieces fitted where necessary in the main connecting pipework. From the coolers, water flows via the water-turbine to ducts along the length of the condenser; the spray nozzles being screwed into these ducts, and arranged to spray against the flow of steam in order to obtain the most complete mixing. A further set of spray nozzles is provided for the water returning from cooling the auxiliaries associated with the plant. Any non-condensible gases present can either be removed by steam-jet air-ejectors, or by air-pumps such as the rotary Leblanc type.

It will be appreciated that the actual "tower" is more-or-less similar to those required for conventional systems. With induced-draught plant, for example,

it will consist essentially of a frame-work to support the coolers, constructed in either wood, steel or reinforced-concrete. With a natural-draught plant the tower again serves to support the coolers, but, in addition, acts as a chimney. Here, the essential difference when compared with conventional practice is an increased diameter. This is explained by the fact that as no cooling takes place by evaporation, a " dry " system would probably require three times the volume of air flow to operate with units of the same capacity.

350-MW Turbo-Alternators for Drakelow 'C'

Elsewhere in this issue we make reference to the fact that The English Electric Co. Ltd. has been asked by the Central Electricity Generating Board to proceed with the design of the two largest single-shaft steam turbo-alternators yet to be built in Europe. The order, one of the most important of recent years, will be worth nearly £5 million, and will include the two 350-MW sets with their associated feed-heating and evaporating plants. The design of the 350-MW steam turbo-alternator is significant as it represents an outstanding stage in English Electric's progressive policy to continue the development of the large single-shaft, single-alternator unit. This policy results in increased economy in fuel consumption, in unit cost, in space occupied, and in operating staff, and it enables the C.E.G.B. to implement its own policy of using large units sited near the coalfields to help to hold down the price paid for electrical power. The sets are to be installed in the Board's new Drakelow " C " Power Station near Burton-on-Trent, and the East Midlands coalfield ; ultimately the total installed capacity of the station will be 1,400 to 1,500-MW.

The English Electric Co. Ltd. has already successfully developed tandem reheat steam turbo-alternators. The company was the first to receive orders for 200-MW sets in 1955, and also orders for 275-MW sets in 1958. Five 200-MW machines are being supplied to High Marnham (of which one set is already in operation) while two 275-MW sets were ordered for Blyth " B " (C.E.G.B. North-Eastern Division). The company is also supplying two 200-MW sets for Vales Point power station in New South Wales, Australia. The 350-MW unit for Drakelow " C " includes a three-cylinder, 3,000 r.p.m. reheat turbine with quadruple exhaust arranged as a tandem compound unit coupled to a hydrogen/water-cooled alternator of the direct-cooled type. In the turbo-alternator, solid couplings are to be employed between cylinders, and each shaft will be mounted on two main bearings so that the assembly and maintenance of the machine are kept as simple as possible. The general arrangement of the machine is thus similar to the 275-MW units at present in course of manufacture for Blyth " B." In line with modern developments, the turbine will operate with inlet steam conditions of 2,300 lb./sq. in. and 1,050 deg. F., with reheat steam returning from the boiler to the intermediate pressure cylinder at 1,050 deg. F. The vacuum at maximum and economic rating is 28.7 in. Hg. (Bar 30 Ins.). To meet the specified high-pressure and temperature requirements, the high-pressure cylinder will incorporate a double-casing arrangement over the first stages, with the expanded steam returned over the outside of the inner-casing to pass through the remaining stages. These combined features enable the pressure differences and operating temperatures in the metal to be reduced, compared with those applied to a single-casing design. The intermediate-pressure cylinder will have a partial double-casing construction similar to that of the high-pressure cylinder. The quadruple-flow low-pressure cylinder will be arranged in two double-flow low-pressure casings, each casing exhausting to one of the two condensers forming the twin-condenser unit. The condensing plant will be supplied by Hick Hargreaves & Co. Ltd. The machines will be provided with proven automatic shaft gland sealing arrangements, while improved electronic supervisory gear with centralised control will be used in the station to simplify control and to give better safeguards for reliability, particularly in relation to speedy starting and running up to load. The alternator will be of the direct-cooled conductor type, employing a water-cooled stator winding and a hydrogen-cooled rotor, the rated gas pressure being 45 lb./sq. in. g. On conventional solid conductor machines, the practice of increasing alternator gas-pressure to obtain the economic advantages of machines of larger output has been extensively adopted for a number of years but an economic limit is reached at about 30 lb./sq. in. In the case of direct-cooled machines, the economic limit is much higher and the output for a given machine size can be increased much more for a given increase in operating gas-pressure.

An artist's impression of one of the 350-MW turbo-alternator sets which The English Electric Co. Ltd. are to design for installation at Drakelow " C " power station. When completed these machines will be the largest single-shaft steam turbo-alternators to be built in Europe.

The feed-heating system will have seven bled-steam stages, comprising three surface-type low-pressure heaters, followed by a high-level storage deaerator of the direct-contact type, and by three high-pressure heaters of the surface type. The feed system will employ dual pumping, the three high-pressure heaters being interposed between the booster feedpump and the main boiler feed-pump. The contract includes main boiler feed-pumps, either driven by separate auxiliary steam turbine or variable speed coupling from the main turbo-alternator shaft.

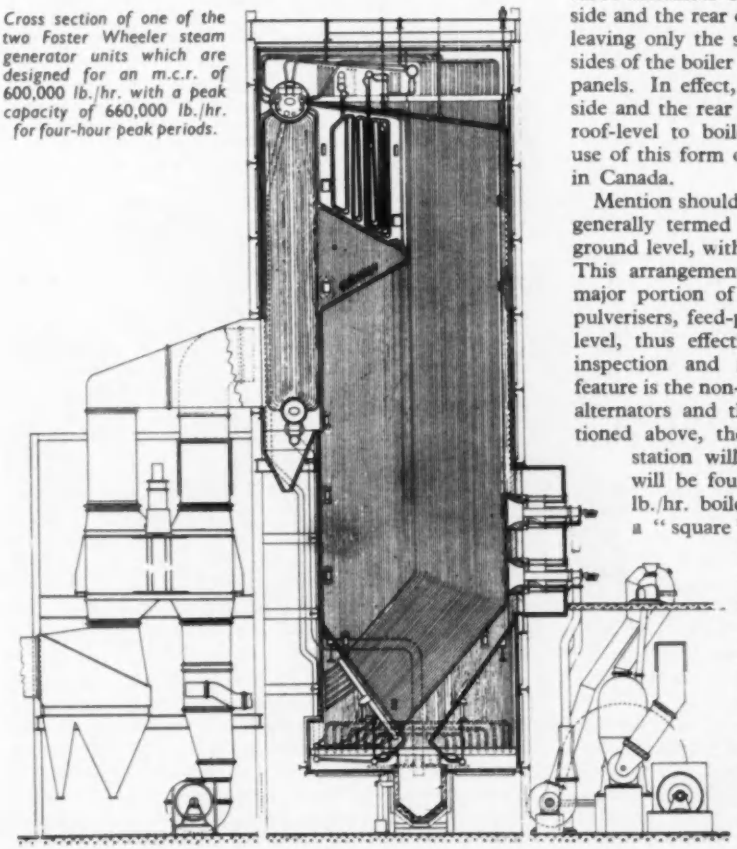
Babcock & Wilcox Limited announce that they have received an order, worth approximately £5½ million, from the Central Electricity Generating Board, to supply a 550-MW, pulverised-coal-fired radiant-type boiler for installation at Thorpe Marsh generating station, now under construction on a site near Doncaster. The boiler will, it is stated, be the largest single-furnace unit in the world ; it will burn approximately 200 tons of coal per hour (5,000 tons a day), and will have an evaporative capacity of 3,750,000 lb./hr. By careful design, a high degree of compactness has been achieved in the design of the boiler which will have the greatest output ever required from a single unit. When completed, it will be approximately 170-ft. high. It will have a single, fusion-welded high-pressure steam drum, 130-ft. long and weighing some 265 tons. The centre-line of the drum when raised to its final position will be 160-ft. above ground level. The boiler will supply steam to the second 550-MW turbo-alternator ordered for Thorpe Marsh, at a pressure of 2,400 lb./sq. in. and a temperature of 1,055 deg. F. In accordance with modern practice with large boiler units now being installed, the steam, after passing through the high-pressure section of the turbine, will be returned to the boiler for re-heating to the original temperature of 1,055 deg. F. The first boiler unit (of similar capacity) for steaming the initial 550-MW generating set is, it will be remembered, being supplied by International Combustion Limited, who received the order from the C.E.G.B. for the unit early in 1958.

New Canadian Power Station

A new thermal power plant installation of somewhat novel design and which will have an ultimate generating capacity of 264-MW

IT was most appropriate that during the Royal Visit to Canada last year Her Majesty the Queen should open the new Queen Elizabeth power station of the Saskatchewan Power Corporation at Saskatoon. The station occupies a site of some 85-acres, approximately two miles from the city of Saskatoon, and adjacent to the South Saskatchewan River, which provides adequate supplies of cooling-water. The main items of plant installed at the new station comprise two boilers, designed and erected by Foster Wheeler Limited, St. Catherine's, Ontario, each with an m.c.r. of 600,000 lb./hr., and two 66-MW turbo-alternator sets, supplied by The English Electric Co. Ltd., London. Provisions to double this installed generating capacity are allowed for in the general design of the station.

A primary reason for the station site selection was because of its strategic location as the hub of the northern load area of the utility's system. Connections will be made with other stations in the area, and in addition a connection will be made by means of high-voltage transmission lines to the new Boundary Dam generating station now under construction near Estevan, and to the existing Estevan station by two main routes. This connection will permit an interchange of power between the utility's northern and southern systems, and will play an important part in the complete integration of electric power generating facilities throughout Saskatchewan Province.



Cross section of one of the two Foster Wheeler steam generator units which are designed for an m.c.r. of 600,000 lb./hr. with a peak capacity of 660,000 lb./hr. for four-hour peak periods.

A number of interesting design features should be mentioned in relation with the station. For example, provision has been made for burning three types of fuel, viz.: coal, natural-gas and bunker fuel-oil. In this connection, the station's central location on a main railway line permits ample facilities for the receipt and storage of coal supplied from the adjacent province of Alberta. Also within a radius of approximately one mile, the station can draw upon the natural-gas transmission line from the Brock-Coleville fields, and the refinery that supplies the bunker fuel-oil.

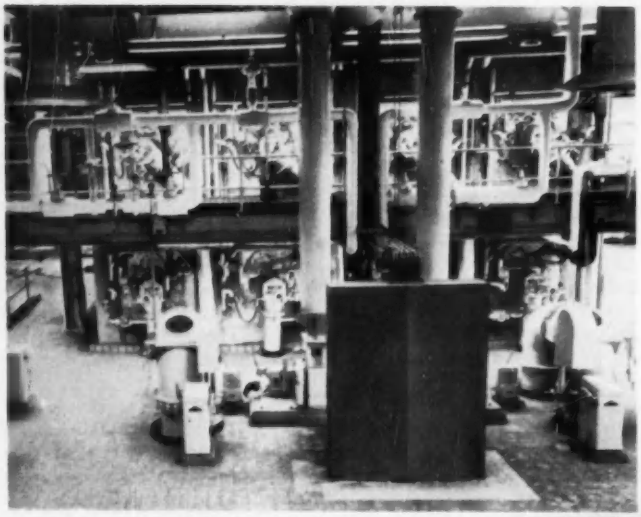
A further feature of the station design is the semi-outdoor construction employed for the two steam-generating units which serve the power plant's two turbo-alternator sets. These are so arranged that one side and the rear of each boiler are exposed to the open, leaving only the spaces between each boiler on all four sides of the boiler house to be closed with insulated metal panels. In effect, this type of construction exposes one side and the rear of each boiler, from the turbine room roof-level to boiler top level, and represents the first use of this form of semi-outdoor construction anywhere in Canada.

Mention should also be made to the locating of what is generally termed the basement floor level at, or near, ground level, with the operating floor level 30-ft. above. This arrangement has permitted the installation of a major portion of heavy auxiliary equipment, including pulverisers, feed-pumps, and other auxiliaries at ground level, thus effecting ready accessibility for equipment inspection and maintenance. An additional design feature is the non-conventional arrangement of the turbo-alternators and the associated unit boilers. As mentioned above, the installed generating capacity in the station will ultimately be doubled. Thus, there will be four 66-MW machines, and four 600,000 lb./hr. boilers—the plant being arranged to form a "square" layout, with the two turbine rooms on opposite sides of the square. This arrangement allows for the provision of a compact and centralised control system, and also makes possible considerable savings in both building and installation costs.

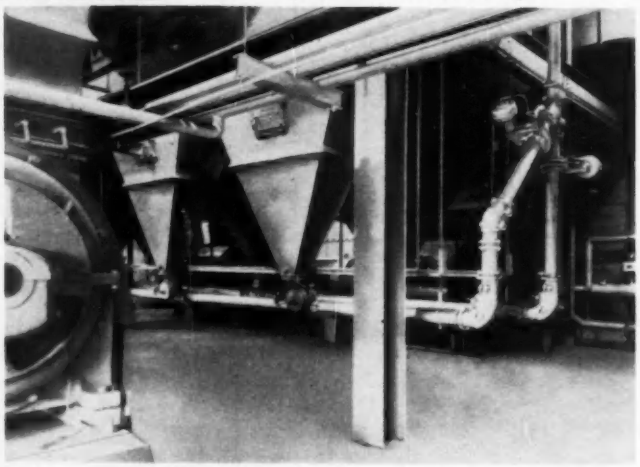
The two Foster Wheeler steam generating units are each provided with integral superheater, burners, coal-handling and pulverising equipment, air-heaters, draught plant, and dust-collectors. Each boiler, standing 108-ft. high from ground level to the top

of the supporting steelwork, has an m.c.r. of 600,000 lb./hr. at 870 lb./sq. in. and 910 deg. F., with feedwater at 370 deg. F. If required, peak capacities of 660,000 lb./hr. can be produced for four-hour periods.

The total weight of each boiler is approximately 1,000-tons, the heaviest single component being the upper, or steam drum, which weighs approximately 50-tons. The total weight of each unit, complete with its auxiliaries, is approximately 2,850-tons. The furnaces are completely water-cooled, and a division wall through the centre of each furnace provides additional heat transfer surface. The front wall and roof of the furnace comprises the radiant section of the superheater, the convection section being of the cross-flow pendant-type, protected from the furnace by screen-tubes, the boiler bank being of the baffleless type. All tubes are expanded into the drums, while the waterwall and superheater tubes are welded "full-bore" to all headers.



(Left). Front view at firing floor level of one of the Foster Wheeler boilers which are arranged for gas, coal, or oil-firing, either separately, or in combination.



(Below). Fly-ash from the boiler dust-hoppers and the dust-collectors is transported in an air stream to an hydraulic ejector. Part of one of the induced-draught fans can be seen on the left.

The setting outside of all waterwall tubes consists of plastic refractory and blanket insulation. The boiler walls are backed with tile, block, and blanket insulation. In general, the inner refractory and block are tube-supported, while the blanket insulation is casing-supported. The radiant superheater front wall is backed with tile, block, and blanket insulation, all of which is entirely casing-supported. All areas of the setting, including the roof and bottom, are enclosed in a steel casing.

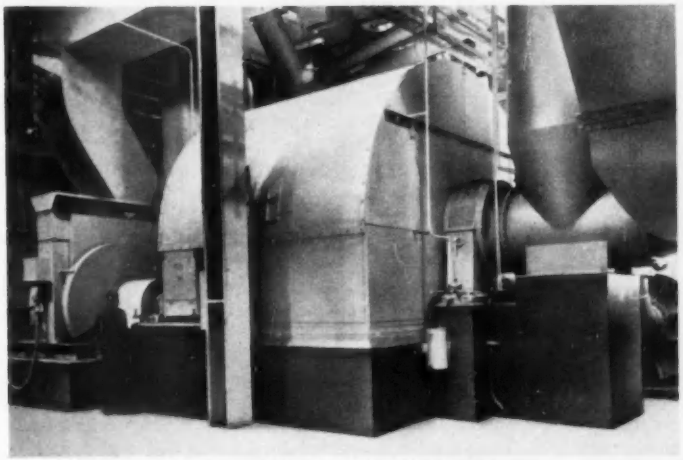
Coal, oil or gas may be used to fire the boilers, either separately or in any combination. In generating 600,000 lb./hr. one unit burns 91,900 lb./hr. of coal. The coal storage area has a capacity of 150,000-tons. When using fuel-oil alone, 40,700 lb./hr. are required, and when using gas, 762,000 cu. ft./hr. are required to achieve full boiler loading.

Coal is transported to the site in rail wagons and dumped into crushers by means of a rotary dumper capable of handling 15 wagons per hour. Conveyors, capable of handling 350-tons/hr. (700-tons/hr. ultimately), deliver the coal to secondary crushers, then to bunkers in the boiler house, or to the coal storage area. The coal flows from the coal bunker at the front of the boilers through vertical chutes to four feeders per boiler which deliver the required quantity of fuel to two ball-mill pulverisers associated with each unit. The mills are of the Foster Wheeler type D-8-C each capable of handling 50,100 lb./hr. of sub-bituminous coal, $\frac{3}{8}$-in. size, 35 Hardgrove grindability, containing 24 per cent. moisture, 8 per cent. ash, and having a calorific value of 8,480 B.Th.U./lb. as fired. These units, which are the largest of their type operating in Canada at the present time, are of the double-ended design; raw coal being fed to both ends and the pulverised coal being drawn from both ends of the mill. Each mill serves four burners through two exhausters.

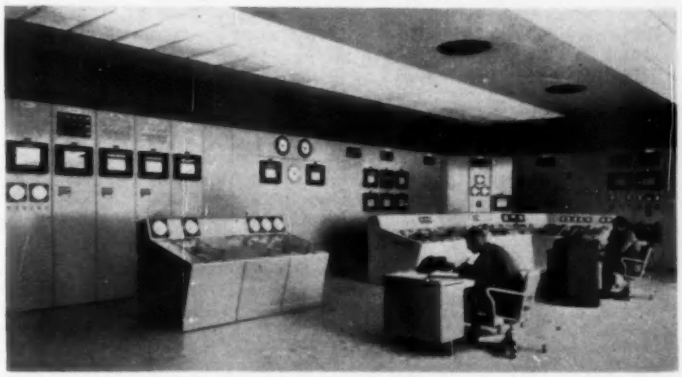
Coal fed to the pulverisers is mixed with preheated primary-air, the free surface moisture is evaporated, and the fuel is ground to a fineness of 65 per cent. through 200-mesh. The air/coal mixture is then drawn from the mills through classifiers by four exhausters which deliver the mixture through eight register-type burners into the furnace where it is intimately mixed with preheated

secondary air and burned. Cold air, delivered through a small duct from the forced-draught fan, tempers the preheated primary air entering the ball mills to maintain the desired temperature of the air/coal mixture. Ash is removed hydraulically from the furnace through a flooded-water impounded ash-pit hopper, fabricated of steel plate, lined with refractory and hard-burned paving brick. The mixture of water and ash is then pumped to an ash-settling pond.

Each burner is complete with a steam-atomising oil gun and gas ring to permit the burning of the three fuels, independently or in any combination. The gas



(Above). Type D-8-C Foster Wheeler ball mill pulveriser, of which there are two per boiler. These units, of double-ended design, are the largest of their type at present operating in Canada.



(Right). Main station control room serves as the electrical control room for the station, the switchgear compound and the northern rural area.

electric igniters provided each have a capacity of 3,000,000 B.Th.U./hr.

On leaving the top of the furnace, the flue gas passes horizontally through two rows of slag screen tubes and the convection superheater bank, then vertically downward through the boiler bank. From the boiler outlet, located immediately above the lower drum, the flue gases pass vertically through two regenerative-type air heaters, arranged in parallel, and then to two mechanical dust-collectors and two induced-draught fans, both in parallel, to a single chimney.

Cold air from the two f.d. fans passes vertically upward through steam air-heaters, used to protect the main air-heaters from corrosion, and the main regenerative-type heaters. This preheated air flows along each side of the unit to the front where the secondary air is delivered to the inlet ducting and burners from the top, and forced into the furnace with the fuel. The " primary " air is tapped off and delivered to the pulverisers to dry the fuel and to prevent the finely-ground coal from sticking to the coal feed pipes between the pulverisers and burners, and to provide an intimate mixture of air and fuel.

The water-treatment plant provided conditions the water for both boiler operation and for station domestic purposes. In the pumphouse, the river water is chlorinated and passed through a clarifier to reduce the turbidity, hardness and dissolved solids. Water for the steam generating units is then passed through sand filters to further reduce the turbidity and then through a demineraliser to remove all dissolved solids.

The condensate return system for Unit No. 1 includes a conventional feed heating arrangement of two low-pressure and two high-pressure heaters with deaerator heater, all fed with bled steam. Foster Wheeler Limited supplied the high and low-pressure heaters which are of vertical U-tube head-up design. The low-pressure heaters each have 1,450 sq. ft. of surface in four passes. The high-pressure heaters each have 2,030 sq. ft. of surface in four passes of 70 : 30 copper nickel tubing with a design pressure of 1,200 lb./sq. in. Water boxes of the high-pressure heaters are of modified lockhead design. These heaters were designed primarily for 60-MW rating, but are suitable for 75-MW.

Feedwater enters the boiler steam drum, where it is mixed with the drum water, and then flows through downcomers to the lower drum. The remaining boiler tubes carry water upward to the steam drum, thereby cooling the flue gases and adding heat to the water. From the lower drum, water is drawn through a series of tubes to an unheated U-shaped pipe, running down each side of the unit, and is delivered through tubes to the side and rear waterwall headers at the bottom. The tangent, side, and rear waterwall tubes form the furnace enclosure and deliver the water and steam mixture to the steam drum. The rear wall tubes run directly into the drum, while the side wall tubes terminate in upper headers from which further tubes deliver the mixture to the steam drum. Steam is generated in the rear waterwall, division waterwall, and side waterwalls in the

furnaces, and in the side waterwalls of the convection superheater. Heat recovery equipment consists of a regenerative-type air-preheater for each half of the unit.

A separate circulation path is employed from the upper drum, through an unheated downcomer, to the lower division wall header, located behind the sloping hopper tubes at the rear. Tangent waterwall tubes form the furnace division wall and deliver the steam and water mixture through an upper header and releaser tubes to the steam drum. This particular circulation path is employed to provide water, as steam-free as possible, to these tubes, which are heated on two sides, to prevent superheating the steam in its flow through the tubes, and to insure an adequate steam/water mixture to cool the tubes. The water and steam mixture passes through horizontal centrifugal separators and unit chevron driers to provide steam-free water in the drum and water-free steam for the superheater.

Steam from the top of the steam drum is delivered to the superheater control header. In this header, a condenser, cooled by feedwater to the boiler, condenses some of the steam, when required, to maintain the desired outlet steam temperature at flow rates from below 40 per cent. of the peak load and above. The rate of water flow to this condenser is automatically controlled to achieve this result.

The radiant superheater in the front wall and roof of the furnace contains alternating downflow and upflow tubes. Steam from the control header flows down the downflow superheater tubes to the lower header and then through the upflow tubes to the upper superheater header, located above the convection superheater. Superheated steam, after passing through the convection superheater to the outlet header, located near the steam drum, leaves from two points to the steam turbine inlet. This particular tube arrangement in the convection superheater is employed to keep the tube temperatures as low as economically possible.

By using a radiant superheater in the furnace in combination with a convection superheater, it is possible to maintain design steam temperatures over a wide range of loads without having to utilise the high furnace exit temperatures required if all convection superheating were used, or alternatively, without having to provide excessive amounts of superheater surface. Thus it is possible to maintain furnace exit temperatures that satisfy the fuel characteristics, particularly the low ash fusion temperatures in the 2,000 deg. F. range, which must be handled by these units. Since the steam temperature leaving a radiant superheater decreases with an increase in boiler rating, while that from a convection superheater increases with rating, the series combination results in a steam temperature curve which is inherently flat and requires a minimum of control within the design range.

The condenser superheat control used in these units is claimed to have several advantages: (1) it does not contaminate the steam with feedwater and the accompanying solids as may be the case with control systems which inject boiler feedwater into the steam ; (2) pressure drop through the control condenser is negligible ; (3) control is possible over a wide range of load and control capacity automatically increases as feedwater temperature falls ; (4) metal temperatures are kept to a minimum throughout the superheater.

By utilising the combination radiant and convection superheater surfaces, in conjunction with the condenser control, in these conservatively-rated steam generator units, having low heat absorption rates and low furnace exit gas temperatures, Foster Wheeler Limited have designed an installation which provides a continuous source of power at stabilised steam conditions for maximum turbine efficiency.

Turbo-alternator plant

The 66-MW turbo-alternator sets supplied by The English Electric Co. Ltd., are designed to operate with steam conditions of 850-lb./sq. in., and 900 deg. F. at the turbine stop valve, and for running at 3,600 r.p.m. The continuous maximum rating vacuum is 28.5-in. Hg. Each turbine drives a 82,500-kVA hydrogen-cooled alternator, operating at 0.8 p.f., and delivering 3-phase, 60 c/s current at 14.4-kV. The hydrogen pressure in the alternator is 30 lb./sq. in. Other items of equipment included in the English Electric contract were the main and pilot exciter sets ; the five-stage sheet-type feedheating plant ; and the twin-cell condensing plant with a cooling surface of 48,000-sq. ft., together with duplicate full-duty condensate extraction pumps and air ejectors. Erection work in connection with the installation of the alternator, feedheating and condensing plant was carried out by John Inglis Co. Ltd., Toronto.

New Forge Development Scheme

THE Forge development scheme, inaugurated by Firth Brown at their Sheffield Works in 1953, with the purchase and installation of a 1,750-ton press, with all the necessary furnaces, including a 15-ton rail-type manipulator, is now stated to be working very satisfactorily. Following the completion of the first part of the scheme, a new shop was built for the installation of a new 800-ton press, equipped with a 3-ton mobile manipulator, and with furnaces of the most modern design. The press is now being fitted with automatic precision control. This new addition to the forging capacity already shows a tremendous improvement over the old-type equipment.

The next stage in this development scheme is the installation of a new 4,000-ton press which is being made possible by the acquisition of the premises of W. Griffiths & Sons Ltd., in Brightside Lane, Sheffield. The additional space now available, means that the new press, which is scheduled for operation by early 1961, can be installed whilst the old one is still in operation. The furnaces in this shop were of the old hand-fired type, and conversion of these to the most modern type of producer-gas furnaces will be completed by the time the press is ready for service.

The extra room acquired, totalling some 5,500 sq. yd., will allow extension of the 1,000-ton press bay, where the installation of three new presses of the 800-ton type is also planned.

As an indication of the magnitude of the work involved in these new press installations, it may be mentioned that more than 2,000 cu. yd. of earth and clay, weighing approximately 3,000 tons were excavated to allow for the construction of the foundations of the press and furnaces. Some 1,200 tons of concrete were placed for the press foundations, and approximately 2,000 tons for those of the furnaces ; these latter foundations were taken down to a depth of 20 ft. in order to cover a 5-ft. dia. brick sewer from Brightside Lane.

The press, which is 26-ft. overall height, is capable of exerting a force of 800-tons through a hydraulic ram at a pressure of 4,250 lb./sq. in. The " daylight, or clear opening " of the press is 9 ft. with a working stroke of 4 ft.

The crosshead which carries the top tool is capable of exerting the full 800 tons force at a steady speed of 6-in. to 8-in. per second, or alternatively, can be made to give light planishing strokes at the rate of 120 per minute to finish the surface of the material under the press.

New 800-ton hydraulic press in the Sheffield works of Thos. Firth & John Brown Limited.

The operation of the press is controlled by an operator from a control desk with servo-operated control valves giving "finger-tip" operation with accurate and sensitive control. The hydraulic power for the press is supplied by three-throw horizontal pumps which are each driven by 550 h.p. electric motors, the pumps delivering 132 gal./min. at a pressure of 4,250 lb./sq. in. to a set of air-hydraulic bottles which form a reserve accumulator for the system.

Furnaces

The ingots or billets to be forged are heated to between 1,150 deg. and 1,250 deg. C. in six furnaces arranged alongside of the press; two of these furnaces are heated by town gas and the remainder by producer gas. A particular feature of these furnaces is the provision of automatic temperature and pressure control which automatically brings the pieces to be forged to the exact temperature required.

When the ingots or billets have been heated to the correct forging temperature, the bogie on which they are placed is withdrawn from the furnace and the material is picked up by a 3-ton manipulator driven by its own diesel engine and weighing 20 tons. The manipulator conveys the work piece swiftly to the press where the operator and the manipulator driver work in co-operation under the direction of the forgeman to shape the ingot into its final shape and size. If an extra long forging is to be dealt with by the press, then the manipulator is assisted by a 10-ton capacity semi-goliath crane, which carries the end of the forging on the opposite side of the press to the manipulator, by means of a "turning-over" gear operating a Burden chain, supporting the outer end of the forging. In such cases, the crane driver, press operator and manipulator driver have to work in unison under the direction of the forgeman, as the complete operation is essentially one of team work. The handling arrangements are completed by a 10-ton capacity overhead electric crane, which loads the furnaces and carries out general purpose duties in the shop.

It has been found that working conditions have been much more comfortable than those usually found in shops of this type because of the increased efficiency and design of the furnaces, leading to lower heat losses and incidentally, making quite a contribution to cleaner air.

BOILER AVAILABILITY IN AUSTRALIA

Speaking in Sydney recently, Mr. F. H. Roberts [chief engineer, John Thompson (Australia) Pty., Ltd.], said that boiler availability was becoming increasingly important in Australia, in view of the rapid progress and expansion in the electricity supply industry. The size of modern boiler installations, as exemplified by the 200-MW boiler/turbine units at the Vales Point Power Station of the N.S.W. Electricity Commission, was such that it would be much too costly to have the plant out of commission for very long. Unfortunately, on account of deposit troubles, the boilers cannot match the availability of their associated turbines. The electricity undertakings are, therefore, stipulating that new boiler units should be capable of operating continuously at loads up to maximum rating for at least six months, with only "on-load" cleaning.

Dealing with the actual causes of deposits, Mr Roberts said that the sulphur content of Australian bituminous coals was generally low, but the brown coals of Victoria were in a different category. Comparing the newly-developed Morwell open-cut with the Yallourn seam which had been worked for the past 35 years, he stated that Morwell coal had a higher sulphur content (1.6 per cent.), and an ash content of 4-8 per cent., rising in some parts to 15 per cent. as compared with the figure of 2 per cent. for Yallourn. Carbon, hydrogen, and nitrogen contents of all the Victorian brown coals were about the same, but Morwell coal had a higher chlorine content than Yallourn coal, and a lower moisture content (62 per cent. as against 69 per cent.).

Boiler availability experience with units burning Yallourn coal had been good; deposits were slight and were easily removed. Mr. Roberts quoted the example of a boiler generating 200,000 lb./hr. of steam, which operated continuously for periods of six months with only "on-load" cleaning. When shut down for cleaning, deposits on the economiser and primary superheater heating surfaces were found to be slight, there were none on the water walls or on the secondary superheaters, while on the air-heaters there was a moderate amount of easily removed dust (half of it below 10 microns). The deposits on the economiser and on the primary superheater were easily removed by "water-washing."

With Morwell coal, experience to date has been limited so far as large boilers were concerned, but alkali-bonded deposits had been encountered in economisers and superheaters, both with the untreated coal, and with the first batch of briquettes made from it. It therefore seemed that a complete change would have to be made in the operating routine, owing to the use of Morwell instead of Yallourn coal on these particular boilers. Boiler operators in Australia could not afford to be complacent about deposit problems. Such problems might arise at any time, particularly as the result of changes in fuel characteristics, and he (Mr. Roberts) was, therefore, glad that steps were now being taken to form an Australian "Boiler Availability Committee." This committee should be representative of users, boiler makers, research and educational institutions, and fuel producers. It should not only collect and analyse data on deposits occurring in boilers operating under Australian conditions, but should also initiate investigations into the technical factors involved in deposit problems. Experimental work, including tests on full-scale plant, would be essential, and he hoped that the committee would have the co-operation of all users and boiler makers in its very important work.

FLUIDRIVE HYDRAULIC COUPLING PATENTS

On the hearing of a Motion for Judgement on Friday, December 18th, 1959, in the Chancery Division of the High Court in an action between **Fluidrive Patents Limited** as Plaintiffs, and **Crofts (Engineers) Limited** as Defendants, Mr. Justice Lloyd-Jacob made an order by consent restraining Crofts (Engineers) Limited (whether by their directors, officers, servants, agents or any of them or otherwise howsoever) from infringing the Plaintiffs' Letters Patent No. 538043 which relate to hydraulic couplings, and ordered the Defendants to pay to Fluidrive Patents Limited a sum of £450 by way of agreed damages in respect of the Defendants' infringements of the said Letters Patent. The Judge further ordered the Defendants within 14 days to deliver up to the Plaintiffs upon oath all Articles in their possession or power constructed in infringement of the said Letters Patent and ordered the Defendants to pay the Plaintiffs their costs of the action.

Oil Refinery Instrumentation

WE were invited recently to visit the Chiswick works of Evershed & Vignoles Ltd. to see a large control panel and desk which the company has designed and constructed for installation at the Dinslaken Oil Refinery being constructed by the Kellogg International Corporation for the B.P. Benzin und Petroleum Aktiengesellschaft in Germany.

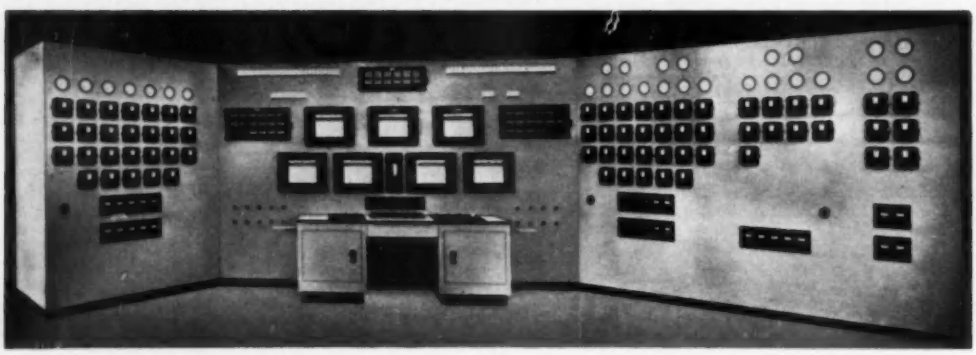
The instrumentation and control equipment at this new refinery, which will initially cover an area of some 300 acres, and which is designed for a daily throughput of 100,000 barrels, is applied to two crude distillation plants, a hydrofiner, a catalytic reformer and a re-distillation unit. The whole of the indication and control facilities are terminated at the control desks and cubicle, and 120 separate control loops are provided, some of them being inter-related by re-setting and cascading arrangements. Temperature measurements from some 340 different points throughout the refinery, effected by thermo-couples and used for indication or control purposes, form part of the installation. There are also two analysis recorders for hydrogen and oxygen.

Four quadruplex recorders are arranged to give selective recording from 64 different points. Each of the recorders' 2-in. charts may be connected by means of a standard jack-plug system to any one of four measuring circuits, so that each recorder covers 16 points. The input signal to the potentiometric recorders is derived across a 1-ohm precision resistor inserted into the circuit when required. Selection of temperature measurements is provided by a switching system based on telephone type key-switch boards mounted on each control desk, so that despite the relatively small number of recorders, comprehensive coverage will be attained. The temperature-measuring circuits consist of a thermo-couple feeding into a potentiometric recorder via the switchboard. In certain loops, d.c. amplifiers are employed to convert the thermo-couple output voltage into a signal for use as a measured value input for a process controller. During normal operating conditions in individual sections of the refinery, a "normal operation" window is illuminated on the panel. Alarm conditions automatically extinguish this light and provide flashing illumination of an "alarm condition" window. Acknowledgment of the alarm, by depressing a push-button on the panel, will change the flashing signal to a steady alarm signal. The interlocking circuitry is so arranged that the steady, i.e., "acknowledged alarm" condition cannot be terminated until the cause of the alarm has been removed. Rapid supervision of the more significant plant parameters is afforded by the wide use of Evershed "In-Line-Scanners." These are essentially moving-coil indicators permanently inserted in the control loops. They present an unbroken shadow line when conditions in each loop are at the desired value. Any break in the line locates an error condition, together with the direction of the error and some indication of its magnitude.

The output signal of the three-term proportional, integral and derivative controllers operates electro-pneumatic valve positioners or converters in which an air-pressure output is established proportional to the electrical control signal. The controllers embody facilities which allow for routine testing without the need for additional equipment. The three thermionic valves and the stabiliser valve incorporated, are mounted on a withdrawable plug-in printed circuit board, which, together with the valves, may be replaced without changing the characteristics of the control loop. Indicators are provided on the front of the controller for the measured value, desired value and controller output.

In most of the plant-mounted transmitters (which operate on the Evershed electronic repeater principle), the physical variable to be measured imposes a turning moment on a centre-pivoted beam, carrying on one end, a coil operating in a magnetic field, and on the other a contact arranged to travel between two stationary contacts. These are connected to sources of positive and negative bias voltage respectively, and transmitted through the centre contact as a result of a beam deflection, to the grid of a thermionic valve in a power unit or controller installed at the central control room.

This bias alteration changes the valve current which is fed back to the beam-mounted coil, connected in the cathode circuit of the valve. The force produced opposes the turning moment generated by the physical parameter. When the two forces are equal, the beam is centralised and no bias is fed to the valve, the current through the valve and coil being proportional to the physical parameter. Indicators, recorders, and other facilities are



Evershed & Vignoles control panel and desk for the Dinslaken Oil Refinery in Germany.

series-connected in the cathode circuit of the valve, and calibrated directly in terms of the physical parameter. As a " force balance " principle is employed, the system automatically compensates for changes in transmission line resistance, additions to indicating or recording facilities, and changes in supply frequency and voltage.

The process controllers receive the measured value signal, from a transmitter and generate a proportional voltage signal A stabilised power source contained within the controller provides a manually-adjustable voltage in the same range representing the " desired value." This is connected in opposition to the voltage representing measured value, and any difference due to a deviation of the process under control from desired conditions is applied to a proportional amplifier, the output of which forms the proportional term of the controller output signal. The deviation also provides the input to integral and derivative networks and amplifiers, the outputs of which are added to the proportional signal so that a true three-term control signal is generated. It is interesting to note that the integral circuitry involves an ingenious " feed back " system which permits extensive integration periods with standard size components and allows for linear integration.

Duke of Edinburgh visits Allen Works at Bedford

WHEN H.R.H. The Duke of Edinburgh visited the works of W. H. Allen Sons & Co. Ltd., Bedford, on Friday, December 4th, it was a somewhat appropriate occasion in the history of the Company, since it coincided with the commencement of the 80th year of the firm's existence. Queens Engineering Works, Bedford, is the largest, and one of the oldest-established enterprises in the town, and is the site of the head office and main establishment of W. H. Allen Sons & Co. Ltd. This establishment, together with a nearby Biddenham subsidiary works, employs about 2,500 people. The company also owns the Atlas Works at Pershore, in Worcestershire, specialising in the production of gearing, and also another establishment at Tidal Basin, London Docks, which concentrates on marine engineering service and installation work.

The origin of the firm dates back to 1880, when William Henry Allen established an engineering works in York Street, Lambeth, London, to make centrifugal pumps. In the following year, the company began the manufacture of steam engines to drive the Allen " Conqueror " pumps, and soon after that the construction of electric generators and the building of complete generating sets for the Admiralty. By 1893, the original works site became inadequate for further extension, and in 1894, the firm moved completely from Lambeth to a new works on the present site at Bedford.

The Duke of Edinburgh inspecting an Allen axial-flow gas-compressor in course of erection at Queens Works, Bedford.

On arrival at the works, His Royal Highness, accompanied by the Lord Lieutenant of Bedforshire (Major Simon Whitbread, D.L., J.P.), was received on behalf of the Company, by the chairman and joint managing director, Mr. W. Kenneth G. Allen, who presented the deputy chairman, Mr. Rupert S. Allen, and the other directors. After lunching in the board room with the Mayor of Bedford, and the directors of the company, The Duke, with Mr. Kenneth Allen and Mr. Norman Allen, proceeded to the works Training Centre where he showed a keen interest in the aims and objects of this important section of the establishment, and also inspected many examples of the work being carried out by the apprentices, all of whom were undergoing their initial six/eight months' course of instruction. The next visit was to the heavy machine shop, and the diesel engine erecting shop and test bay, where he saw arrangements made for the detail and complete assemblies for the different types of engines in course of production, ranging from 100 h.p. up to 1,000 h.p. The Duke then visited the electrical shop, which is devoted entirely to the production of generators, alternators, and electric motors, and then the light machine shop, in which is produced a variety of small-size components in varying quantities, often involving intricate machining operations. In the turbine erecting shop he saw a variety of steam-turbines, gas-turbines, blowers and fans, condenser and steam ancillary equipment under construction, and from there went to the steam-turbine test bay, and the gas-turbine test chamber, where he was shown the arrangements provided for the carrying out of exhaustive tests on the turbines. The Royal visitor was then conducted on the final stage of his tour of the works, viz.—the medium machine shop, and then the large turbine drawing office which occupies the whole of the top floor of the six-storey main office building.

After taking tea with the chairman and directors, The Duke of Edinburgh accepted the invitation of Mr. W. Kenneth G. Allen to unveil a plaque which had been specially made and fixed in the main office entrance hall, in commemoration of the visit of His Royal Highness to the works, as well as the opening of the recently-completed six-storey office block. The new plaque is mounted alongside two other plaques—one commemorating the 25th year of the reign of King George V (May 6th, 1935), and also the visit of the King with Queen Mary to the works (June 27th, 1918). The other plaque commemorates the Coronation of King George VI and Queen Elizabeth (May 12th, 1937), also the visit of King George VI as H.R.H. The Duke of York, K.G., to Queens Works, on February 26th, 1920.

" EEL " Flue Dust Monitor

Of interest to those who wish to monitor the concentration of large dust particles emitted from industrial chimneys, this instrument was designed by the Central Electricity Research Laboratories, and is being manufactured under licence. The information obtained by use of the flue-dust monitor serves as an indication of power station efficiency, in addition to assisting in the control of harmful grit emission. A small sampling duct faces into the gas stream and receives dust particles which fall onto a glass collector, a beam of light is projected from outside the duct, through the glass plate and back into the measuring unit, where it focuses on to a photo transistor. Dust concentration is determined by means of a density wedge in the beam. A second identical transistor is lit directly by the lamp to provide reference, and both transistors are coupled to a differential relay in the control unit. Readings are presented on a graphical twenty-four hour recorder chart. The instrument operates continuously, and provides measurements at pre-set periods. It is manufactured by Evans Electroselenium Limited, St. Andrews Works, Halstead, Essex.

The Prevention of Sulphuric Acid Dew Point by Teramin*

NUMEROUS accounts have, from time to time, been published in the technical press in several countries describing means for the prevention of dew-point corrosion by flue gas of various items of steam generating plant and associated equipment. The following notes describe some laboratory tests carried out on the method patented by the Midland Tar Distillers Limited, Oldbury, Birmingham, (B.P. 734,910 and numerous foreign patents), and incorporating the use of Teramin. Teramin is the trade name used by the company for heterocyclic tertiary amines from coal tar; when applied according to their British Patent. The material is an organic liquid distilling over a range of 150-180 deg. C. and having a viscosity similar to that of kerosene. Teramin, which possesses a somewhat unpleasant odour, is claimed to be basic in reaction and a very powerful solvent; it should not be allowed to come into contact with the skin and, furthermore, prolonged inhaling of concentrated vapours should be avoided. The inhibitor should be sprayed into the flue gases at a point where these have a temperature of about 250 deg. C., and the recommended rate of application in the atomised state is between 0.03 and 0.05 per cent. by weight calculated on the rated fuel consumption of the plant. The liquid has a specific gravity of approximately 1.00, it begins to boil at 150 deg. C., at 160 deg. C. 93 per cent. "boils over," and at 170 deg. C., 100 per cent. of it is in the vapour phase. The flash-point is about 70 deg. C., and the viscosity 1 deg. E/20 deg. C. The quantity required to prevent sulphuric acid corrosion is, however, dependent upon the individual characteristics of the boiler plant concerned, and is therefore by no means standard for every case. It is dependent primarily on the temperature of the surfaces to be protected, and on that part of the sulphur dioxide content in the gases which can be converted catalytically to sulphur trioxide. A small compressed-air type of atomiser is recommended for the application of Teramin, and only ferrous metals should be used. The inhibitor attacks copper and brass, and is liable to dissolve most types of packing material, although pure asbestos or soft lead may be used.

Dr. Wickert investigated closely the attack by various strengths of sulphuric acid at various temperatures upon iron test-pieces, and produced experimental data showing the concentrations of acid which can occur on metal surfaces at various temperatures. He also demonstrated the inhibiting effect of Teramin on the acid attack. The accompanying sets of curves and data included in Figs. 1-4 summarise the work. Fig. 2 shows the corrosion of steel on a much more extensive scale than that plotted on Fig. 1. The maxima of curves "a" and "b" cannot therefore be seen. The curve "h" can be used for comparison purposes:—20 per cent. sulphuric at room temperature on steel causes strong evolution of hydrogen. Fig. 2 also shows that the attack of this acid amounts to 0.3 g./100 sq. cm. per hour. In practice, therefore, the addition of Teramin will only be justified, when it results in significantly less corrosion than this, on the cold end, and at whatever the surface temperature. Later tests showed that the sulphuric acid concentration at a surface temperature of 100 deg. C. is about 68 per cent. Curve "d" shows that the corrosion by acid of this strength, mixed with Teramin in proportion 1 : 5, is practically nil. At still higher concentrations this is not the case, but no significance attaches to this. Curve "a" confirms that 68 per cent. sulphuric acid containing no Teramin causes heavy corrosion at 100 deg. C., while curve "b" shows that this quantity of corrosion is greatly reduced, but not sufficiently, when Teramin is mixed with the acid in the ratio 1 : 0.1.

Satisfactory results can only be obtained by the conditions indicated by curve "d." At surface temperatures of 120 deg. C., the sulphuric acid strength, under boiler operating conditions, becomes about 75 per cent. According to curve "g" the corrosion by 75 per cent. acid containing Teramin (1 : 1) at 120 deg. C. is very slight,

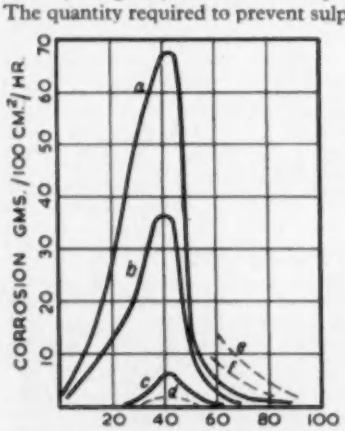
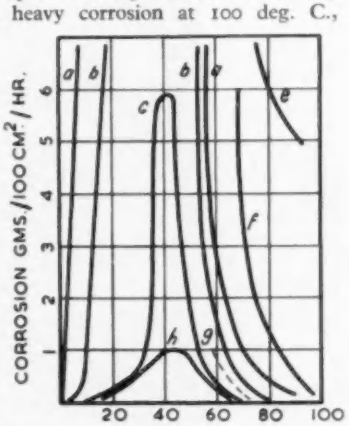


Fig. 1 (*left*)

(a) H_2SO_4 at 100 deg. C.
(b) " + Teramin 1 : 0.1 at 100 deg. C.
(c) " + Teramin 1 : 1 at 100 deg. C.
(d) " + Teramin 1 : 5 at 100 deg. C.
(e) " at 150 deg. C.
(f) " + Teramin 1 : 0.1 at 150 deg. C.

Fig. 2 (*right*)

(a) (a) H_2SO_4 at 100 deg. C.
(b) (b) H_2SO_4 + Teramin 1 : 0.1 at 100 deg. C.
(c) H_2SO_4 + Teramin 1 : 1 at 100 deg. C.
(d) " + Teramin 1 : 5 at 100 deg. C.
(e) " at 150 deg. C.
(f) " + Teramin 1 : 0.1 at 150 deg. C.
(g) " + Teramin 1 : 1 at 120 deg. C.
(h) " at 20 deg. C.



*Abridgment of paper by Dr. K. Wickert of Berlin Electricity Authority, August, 1959.

and in practice probably quite low enough. At surface temperatures of 150 deg. C., the sulphuric acid is 82 per cent. Curve "e" shows that pure 82 per cent. H_2SO_4 containing no Teramin gives rise to extraordinarily high corrosion. This drops considerably, but is still too high to allow for efficient boiler operation, when Teramin is added in the ratio 1 : 0.1 (see curve "f"). If the quantity of inhibitor added is raised, to give 1 : 1 proportion, then curve "k" results. With 1 : 5 proportion, the corrosion is further reduced to less than 0.1 g./100 sq. cm./hr. at 150 deg. C. Repetition of the corrosion tests, with a once-used mixture, shows practically no attack. By prolonged pre-heating at 150 deg. C. the effect of the sulphuric acid becomes nullified by the reaction with Teramin. The experiments illustrated graphically indicate that Teramin can be expected to give good protection against sulphuric-acid dew-point corrosion,

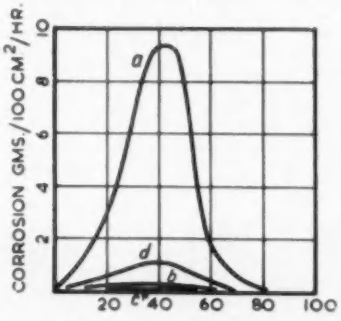
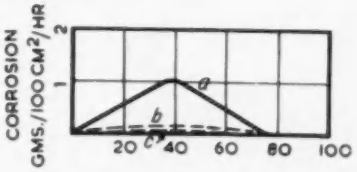


Fig. 3.

(a) H_2SO_4 at 60 deg. C.
(b) H_2SO_4 + Teramin 1 : 1 at 60 deg. C.
(c) H_2SO_4 + Teramin 1 : 5 at 60 deg. C.
(d) H_2SO_4 at 20 deg. C.

Fig. 4.

(a) H_2SO_4 at 20 deg. C.
(b) H_2SO_4 + Teramin 1 : 1 at 20 deg. C.
(c) H_2SO_4 + Teramin 1 : 5 at 20 deg. C.



when it is present in excess in the sulphuric acid-Teramin mixture which deposits. The excess should be made greater as the surface temperature of the "cold ends" increases. It must be assumed that it is advantageous in practice for the Teramin to be injected before starting up the boiler; this forms a surface film and can ensure that the Teramin is always present in excess. The maximum effect is then obtained when Teramin is added continuously; this means that the sulphuric acid and the Teramin will condense together. In these conditions, surfaces with temperatures of 150 deg. C. will be adequately protected, if the temperatures of maximum condensation (the practical dew-point curve) are of that magnitude.

Fig. 3 shows results for corrosion at 60 deg. C. The comparison curve is once again that for H_2SO_4 free from Teramin at 20 deg. C. ("d"). Curve "a" at 60 deg. C. is much higher. The concentration of the sulphuric acid deposited on the hot surfaces is 43 per cent. This concentration results in a corrosion maximum. When Teramin is used, this fact loses importance, because the passivation effect of Teramin at 60 deg. C. is so strong that even in 1 : 1 ratio (curve "b") the maximum is sufficiently low. In ratio 1 : 5 (curve "c"), the maximum is practically zero. The results of the experiments confirm that Teramin affords greater protection against acid attack, as the temperatures of the surfaces to be protected decrease.

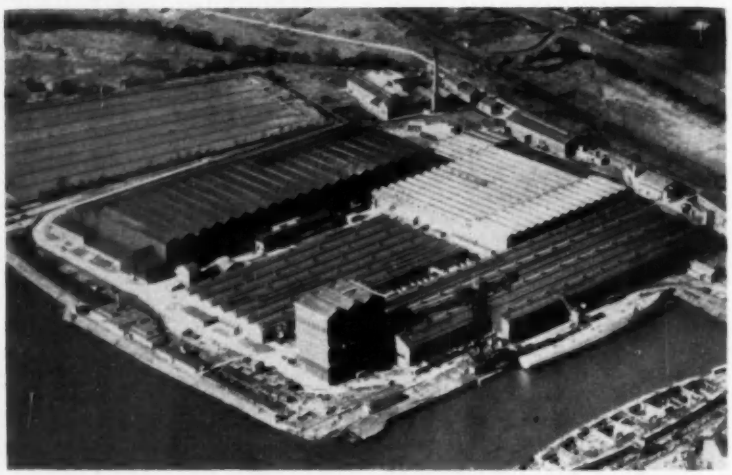
In brief it will be seen that the most corrosive condition is that of fairly high temperature associated with a 45 per cent. concentration of sulphuric acid. The inhibitor in the ratio of 0.1 part of inhibitor to 1 part of 45 per cent. acid reduces the corrosion by some 50 per cent. At lower temperatures and with more dilute acid, the effect of the inhibitor is much more marked, and when concentrations of acid and inhibitor reach equal proportions, the reduction in acid attack is quite spectacular over the whole range of acid concentrations. Dr. Wickert states that it is advantageous to inject Teramin on to "cold-end" surfaces before starting up the boiler plant, and he explains that if metal surface temperatures are as high as 150 deg. C., then the amount of Teramin present during operation should be in excess of the sulphuric acid deposited. Conversely, he points out that the colder the metal surface then the better the protection will be. The author describes his experiments in concentrating sulphuric acid at various temperatures to indicate the strength of acid to be expected; he refers to earlier publications on dew-point, and also discusses the mechanism of the formation of SO_3.

The laboratory experiments show that good results can be expected from the use of Teramin, in the protection of the hot surfaces against sulphuric acid corrosion. At high dew points for the flue gases, the Teramin must be present in excess, as compared with the acid. The assumption is justified that even more favourable results can be expected in practice than in laboratory tests, since reactions may occur between the Teramin and acid of certain concentrations which cause neutralisation of the acid. In oil-fired boilers, a Teramin film on the cooler surfaces will not become harmful since the ash-content of the oil is slight. However, in coal-fired boilers it may happen that fly-ash saturated with Teramin will adhere more easily to the surfaces than dry ash would, and the surfaces moistened with Teramin will probably collect fly-ash more readily. Only investigation of actual practice can provide useful information on this point. These effects will probably not be harmful, and it will be simple to adopt measures to prevent them. The problem is possibly that of selecting the correct quantity to be added. In the case of coal-fired boilers, it is obvious that less Teramin is required than in oil-fired boilers. At equal surface temperatures, the acid in an oil-fired boiler has a lower concentration than in the coal-fired unit. Like pyridine, Teramin reacts violently with sulphuric acid, causing much evolution of heat. On cooling to room temperature, solid Teramin sulphate separates out, and this becomes liquid again at 50-70 deg. C. Teramin sulphates have the same inhibitor action as Teramin; the inhibitor action is thus not nullified by reaction with the acid. Furthermore, Teramin sulphate is odourless, and at room temperatures and in the presence of moisture, the sulphates absorb water. These sulphates have no flash-point, and do not ignite even on direct contact with a hot flame. Although Teramin has a low flash-point, there is no danger of fire resulting as the result of using Teramin, because the sulphates which are formed do not burn. The sulphates, in contrast to Teramin itself, are easily soluble in water; in fact, it has been found in practice that, when Teramin is used, the surfaces can easily be cleaned with water. Teramin sulphates can be

partly distilled, and the substances change chemically. At 180 deg. C., distillation residue is 52 per cent., this residue containing 40 per cent. SO_4. The theoretical SO_4-content of methyl-pyridine sulphate is 54 per cent. This residue has the same inhibitor action as Teramin or Teramin sulphate. The distillate up to 180 deg. C. has an SO_4 content of 2.5 per cent. The residue is also easily dissolved in water. Since Teramin sulphate and the sulphate obtained by distillation are also good inhibitors, Teramin is an ideal substance for the prevention of dew-point corrosion. The non-inflammability of the sulphate is also of special importance, while the ready solubility is also an advantage. In conclusion, it may be pointed out that the corrosion tests with Teramin give no indication of the quantities to be added for protection of surfaces in boiler practice. The film which forms in boiler practice may explain why the quantities of Teramin necessary for the protection are appreciably lower than they are in the laboratory work. Only practical experience in its application can give a definite ruling on this.

BABCOCK DEVELOPMENTS AT DALMUIR

Marion Power Shovel Company excavators and cranes in several models are to be manufactured in Scotland at the Dalmuir works of Babcock & Wilcox Limited, under an agreement announced recently by Mr. James Mullaney, President of Universal Marion Corporation, of which Marion Power Shovel Company, Marion, Ohio, U.S.A., is a division. These machines will be marketed and serviced by Blackwood Hodge & Co. Ltd., 25, Berkeley Square, London, W.1. Mr. Mullaney stated that the manufacturing facilities at the Babcock & Wilcox Dalmuir works were admirably suited to the production of high-quality power shovels and cranes. The nearby Renfrew works of Babcock & Wilcox Limited are among the largest manufacturing plants in the world devoted to the production of land and marine boiler plant and associated equipment. The forging and casting facilities at the Renfrew works will, it is stated, be ideal for supplying components for the excavating equipment and cranes produced at Dalmuir. The Dalmuir works, where machinery, fabrication and assembly will be handled, cover a total area of about 35 acres, 21 of which are under cover. Readily accessible by water, rail and road, the works are well-equipped with large machine tools, overhead cranes, welding and heat-treatment facilities, and with assembly areas necessary for the efficient handling of the large units manufactured there. Prior to its acquisition by Babcock & Wilcox Ltd. at the beginning of 1959, the factory had previously produced armoured fighting vehicles and tanks for the Royal Ordnance Department. The manufacturing facilities have since been augmented considerably, and the works have been producing large industrial cranes of various types, nuclear power plant, and other heavy equipment. Among its most unusual products is the Goliath crane, more than 240-ft. high, with a 400-ton lifting capacity, and which is now in service at Hinkley Point Nuclear Power Station site. Customers in many parts of the world, as well as the manufacturing companies involved, are expected to benefit considerably from this new combination of European manufacture and sale with Marion's 75 years' of experience in product design. Marion Power Shovel Company manufactures a complete range of diesel and electrically-operated shovels, cranes and draglines with capacities of from 3/4 cu. yd. to the world's largest 65- and 70-cu. yd. stripping shovels.



Aerial view of Dalmuir works of Babcock & Wilcox on the River Clyde, some ten miles from Glasgow. The works are equipped with modern facilities for the manufacture of cranes, handling plant, nuclear power plant, welded pressure-vessels, etc.

The State Electricity Commission of Victoria, Australia, has awarded a contract valued at £3.6 million sterling, to **Australian Electrical Industries (Pty.) Ltd.** (acting on behalf of **Associated Electrical Industries Export Limited**) for the supply of two 200-MW steam turbine-generator sets and associated equipment. The plant is for the new Hazelwood power station to be constructed in the Latrobe Valley area of Grippsland, approximately 90 miles east of Melbourne. The power station will have an ultimate capacity of 1,200-MW, and the 400-MW of A.E.I. plant will form the first stage of the project. The present contract also includes the supply of condensers and a feed-heating plant, boiler feed pumps and make up water plant, cranes and miscellaneous turbine-house equipment. The turbine-generator sets will be manufactured at A.E.I. Trafford Park Works; while the principal items of heat-exchange equipment, including the condensers, will be manufactured in Australia to A.E.I. designs. The turbines will be three-cylinder tandem-compound impulse machines running at 3,000 r.p.m. Inlet steam conditions will be 1,500 lb./sq. in., 1,050 deg. F. at the turbine stop-valve. Steam from the turbines will exhaust to a twin-shell A.E.I. condenser operating at a vacuum of 28-in. Hg with a cooling-water supply of 72,000 g.p.m. at 69 deg. F. Bled steam from the turbine will supply two low-pressure heaters, a deaerator, and two high-pressure heaters, giving a final feedwater temperature of 420 deg. F. from the five-stage system. The generator will be direct-driven at 3,000 r.p.m., and will supply a.c. at 50 c/s, 3-phase 15-kV. Cooling of the generator stator windings will be by water circulating in direct-contact with the copper—a system first introduced by A.E.I. engineers. Rotor cooling will be by forced-circulation of hydrogen. Generator exciters will be gear-driven from the generator shaft.

Mr. David Moffat, M.B.E., of the Electricity Council, who has been chairman of the superannuation schemes for the electricity supply industry and has in addition undertaken special duties for the Council, retired from full-time service on December 31st. He is being retained, however, on a part-time basis, in particular as chairman of superannuation schemes.

RECENT *Equipment* AND *Accessories*

New mechanical coal conveyor

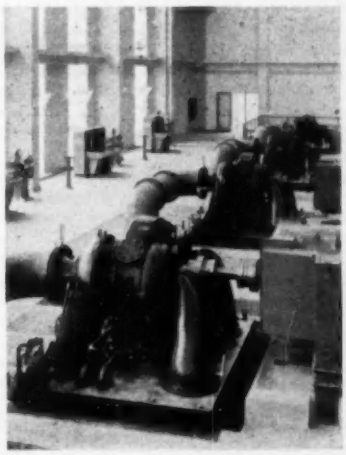
A new type of mechanical conveyor, known as the "Mayrath," is now available. It requires the minimum of space and can be readily incorporated into existing boiler houses. A recent installation, for example, was in a large block of flats where the Ideal Britannia 4K Series boilers are fitted with an Earlymil attachment and an automatic stoking device. However, it was still necessary for the boiler hoppers to be manually loaded. This task has now been obviated by the provision of a 21-ft. "Mayrath" conveyor. The conveyor has been mounted on a rail attached to the roof of the boiler house to provide a means of moving it from one boiler to another as required. Bulk deliveries of anthracite grains are made in the normal way. The screw of the conveyor is inserted in the anthracite, and when this is revolved by the action of the motor mounted at the head of the tube, anthracite is carried up the tube, and upon reaching the top it falls into the hopper for direct feeding to the boiler by means of a manually-operated slide valve. The "Mayrath" comprises a 6-in. diameter, one-piece galvanised metal tube which carries inside it a rotating Archimedes-type screw. This is driven by means of a vee-belt from a pulley on an electric motor or petrol engine, which is fitted either at the head of the conveyor, or on a special mounting on a carriage. When granulated materials are fed into the tube at the pick-up point they are conveyed along it by means of the rotating screw and ejected at the outlet point. The conveyor is capable of dealing with quantities of 30-40 tons/hr., or 38-40 cu. ft./min. depending upon the fuel involved, the angle of use and rate of feed. (*Gordon Felber & Co. Ltd., Oxford Circus, London, W.1.*)

Fig. 1 (left). A Mayrath conveyor installed in the boiler room of a large block of flats. (Gordon Felber & Co. Ltd.)

Fig. 2 (above). Four Demag four-stage turbo - compressors installed at a French automobile works. They have a total capacity of 28,300 cu. ft./min. (William H. Capper & Co. Ltd.)

Twin-shaft design for low air capacity turbo-compressors

Demag four-stage turbo-compressors with air intake capacities as low as 5,000 cu. ft./min. for pressure ratios up to 15 : 1, are now available from William H. Capper Limited, under their recent agency agreement with the Compressor Department of Demag A.G., of Duisberg. There are nine machines in the new range, with air inlet capacities from 5,000 to 30,000 cu. ft./min. The Demag machines have four impellers, mounted on two parallel pinion shafts which are driven at two different speeds by a large central gear. The shaft carrying the first and second stage impellers rotates between 9/12,000 r.p.m., the other at 16/18,000 r.p.m. By this means optimum impeller speeds are obtainable at all stages and, as a consequence, the number of impellers can be reduced to four. Another design feature helping to increase impeller efficiency, is the large unobstructed air inlet to each impeller. The impellers are mounted at each end of each driving pinion, and overhang them, so that there is no driving shaft to interfere with air intake. The placing of the gear between the two pairs of impellers, and the reduction of the number of impellers to four, saves space and weight. In addition, it allows the machine to be delivered and installed as one unit, and so greatly reduces overhead cost. As the machine is virtually vibration free, foundations and basement can be of a much lighter construction. (*William H. Capper & Co. Ltd., Mayfair House, 9, Hertford Street, London, W.1.*)



Welding electrode holders

Two new electrode holders, the "Handicool" 600 and 600 (Insulated), for manual arc welding are now available from Quasi-Arc Limited. The main feature of these holders is the new lever shape which is angled close to the handle to give better access to confined spaces. The handle and lever both have D-shaped cross-sections, providing a compact, well-balanced grip for welding in any position. The holders are designed so that they can be held with a "long" grip at the end of the handle when using high currents, or with a "short" grip close to the jaws to give a good control of the electrode tip. A further point is that the holders are claimed to remain exceptionally cool even after long periods of welding. Insulating material round the jaws of the fully-insulated version is tough, non-hygroscopic, resistant to heat and fracture, and is renewable when worn. Both holders have special deep-groove slots machined in the copper alloy jaws, including

one along the axis of the holder to simplify overhead welding. The spring, situated behind the guard, is completely protected from spatter, and is insulated. Weight of the "Handicool" 600 is 21-oz., and of the insulated version, 23-oz. Maximum current is 600-amperes, and the range of electrode sizes extends from 10 S.W.G. to ⅜-in. (*Quasi-Arc Limited, Bilston, Staffs.*)

Multi-stage non-synchronous timer

Lancashire Dynamo Electronic Products Limited, announce that a number of new models of multi-stage non-synchronous timing equipment have now been added to their range of resistance-welding control equipment. The new units (Series RCW.25) have been designed to provide a compact inexpensive assembly suitable for building into resistance-welding machines, and incorporate switching arrangements for air valves and electromagnetic or Ignitron contactors. Three basic units are in production for two, three or four-stages of time control. Typical control sequences are "Weld-Forge," "Weld-Hold-Off," and "Squeeze - Weld - Hold - Off"; all units being provided with facilities for single or repetitive spot operation. The four-stage unit, particularly interesting in view of the increasing use of pressure before weld sequences, enables the conventional pressure switch to be omitted if this is considered to be desirable. A very high rate of repetitive spot welding has been achieved with this timer and welding rates of 180 spots per minute have been achieved. (*Lancashire Dynamo Electronic Products Limited, Rugeley, Staffs.*)

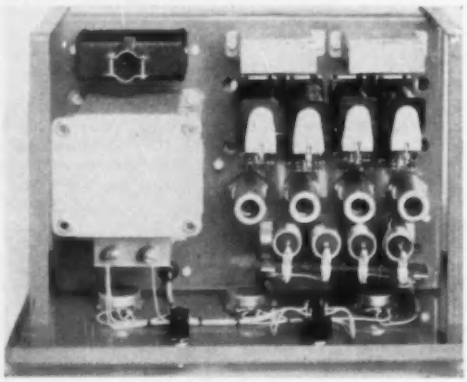


Fig. 3. Interior of the three-stage model, multi-stage non-synchronous timer. (Lancashire Dynamo Electronic Products Ltd.)

Industrial oil-fired air-heater

A new range of industrial air-heaters known as the "Turbo-Static," and available in three sizes, 250,000, 350,000 and 500,000 B.T.U./hr., was introduced recently by Colt Ventilation Limited. The "Turbo-Static" which embodies a fundamentally new system of combustion air supply, has been designed specifically for oil-firing. A pressure-blower forces air into the combustion chamber through a series of vaned slots in the inner chamber wall. The vanes impart a swirl to the air and two contra-rotating air streams are created. These air streams fulfil three distinct functions. First the interaction between them creates air turbulence, which ensures the complete and rapid mixing of the oil mist and the air. As a result excess air requirements are reduced to a minimum. Secondly, the vortices "hold" the flame, so that complete combustion is achieved in a limited space, actually less than 15-in. long. Finally, the outer air stream forms a barrier layer which prevents the flame from impinging on the chamber walls. This means that the size of the combustion chamber can be substantially reduced. It also means that the chamber walls suffer no deterioration caused by flame impingement, because this does not occur. The combustion chamber is isolated and insulated from the main air supply by two outer walls, through which the combustion air flows. In this way conduction heat loss from the chamber to the main air supply is very small and the combustion air is pre-heated to temperatures above the evaporation temperature of the oil mist. Consequently instantaneous combustion occurs throughout the flame. The pre-heating of the combustion air and the reduction in excess air makes it possible for temperatures in excess of 3,000 deg. F. to be achieved throughout the chamber. At this temperature every particle of oil mist is evaporated so that sooting—the incomplete combustion of the fuel—is eliminated. Consequently the burner and heat-exchanger components suffer no deterioration caused by the corrosive effects of sooting. Approximately 5 per cent. of the combustion air enters the chamber unheated, through angled slots around the fuel injection components, with the result that the injection components are cooled continuously and, therefore, protected from the effects of the high-temperature recorded in the chamber. Combustion gases are then forced out of the pressurised chamber into the heat-exchanger. They flow through the exchanger in contra-flow to the main air supply, so that maximum heat-exchange is achieved in the shortest distance. The exceedingly high temperatures result in rapid heat exchange, and the gases are exhausted into the flue with only slight loss in pressure. Ample pressure reserve is thus available, eliminating the necessity for critical flue specifications. Since the combustion chamber is under pressure, the company claim that blow-back cannot occur under any likely circumstances, while in addition the combustion efficiency is completely unaffected by variation in wind or weather conditions, and their resultant effect upon pressure in the flue. Further, pulsations in the combustion chamber cannot occur. The heater operates at a constant, guaranteed efficiency. The air supply to the burner does not have to be adjusted by a skilled operator, to suit outside conditions. All controls and components are fitted within the unit casing. (*Colt Ventilation Limited, Surbiton, Surrey.*)

Automatic dust filter

In collaboration with the German company of Otto Hubbe, Keith Blackman Limited are now manufacturing under a licence arrangement the Fischer automatic dust-filter. This filter is available in two basic types, one of square section containing 24 rectangular filter "pockets" and the other of circular section containing 27 circular filter sleeves. Dust-laden air enters the filter and passes down into the collection hopper where the heavy particles are settled out. The air then passes through the fabric filter pockets in the filter chamber where the remaining dust is trapped while the clean air passes out at the clean air outlet and into the main extraction duct leading to the fan, the filter chamber always operating under suction. Two or more filters are installed adjacent to one another, the number depending on the volume of air and dust passing into the filters. At predetermined intervals which depend on the conditions under which the plant is operating, a motor-operated damper in one

of the filters causes the dust laden air to by-pass the filter, which then undergoes its cleaning cycle. This same motor simultaneously opens another damper and air is drawn through the purging air inlet into the filter chamber (which is under suction), passes through the pockets in the reverse direction (from outside to inside) carrying the collected dust

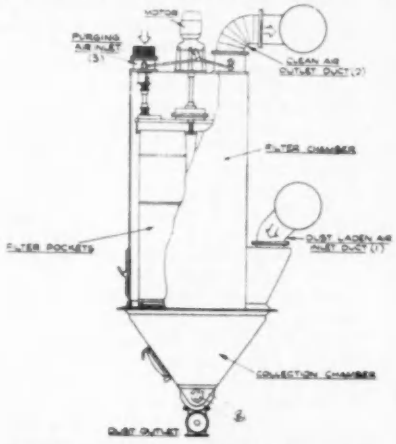


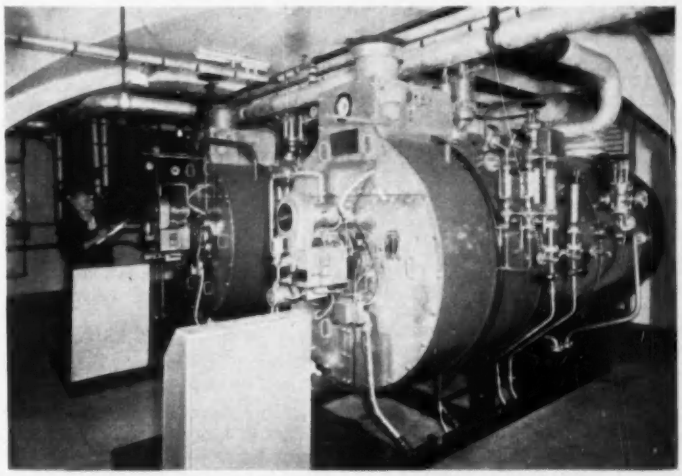
Fig. 4 (left). Outline arrangement of the Fischer automatic dust-filter. This is now manufactured by Keith Blackman Limited, under licence from the German company Otto Hubbe. (Keith Blackman Limited.)

into the main dust collection hopper where most is deposited. The purging air then passes through into the inlet duct to be mixed with the dust laden air which is being directed to the adjacent filters which are meanwhile in normal operation. While the reverse process is taking place a high-frequency vibrating mechanism agitates the pockets in a horizontal plane to dislodge the dust particles clinging to the filter bags. At no time is the filter fabric subjected to the stresses often caused by the "concertina" effect of vertical shaking gear. This, the company claim, ensures for the "Tornado"-Fischer filter sleeves or pockets a long life, while at the same time reducing maintenance and replacement costs to a minimum. The shaking mechanism is completely self-contained in dust-tight cast-iron enclosures. (*Keith Blackman Limited, Mill Mead Road, London, N.17.*)

Packaged boilers

John Thompson (Wilson Boilers) Company exhibited at the recent Scottish Industries Exhibition a "Multipac" boiler, representative of a range of package boilers with evaporations from 2,500 lb./hr. to 18,500 lb./hr. This type of boiler, available as either a solid fuel or an oil-fired unit, is made in eleven sizes. The wet-back combustion chamber dispenses with the necessity for refractory linings, the chamber's adequate volume being obtained by a dished-end design. This feature also reduces the number of stay-bolts, and additional support is given to the combustion chamber by its cleaning door and sootblower supports. Two passes of fire-tubes are arranged below the flue with clear water space above, and the boiler has independent tube-plates. The "Multipac" has its forced-draught fan positioned on top of the front smokebox and, by having the ducting to the burner incorporated inside the smokebox, additional advantage is obtained by the intake to the fans being above the boiler and not, as usually, at floor level. Vibration and noise are almost non-existent because of the quiet operation of both the forced-draught fan and the fully-modulated rotary-cup burner. Capable of burning all types of oil fuel up to and including 3,500 seconds Redwood No. 1, the burner operates without a heating and pumping set. (*John Thompson (Wilson Boilers) Company, Glasgow.*)

Fig. 5 (below). An installation of two Multipac wet-back packaged boilers. Each unit has a capacity of 5,500 lb./hr. (John Thompson (Wilson Boilers) Co.



Tube-expansion control unit

A new dual pneumatically-operated tube expansion control unit, incorporating a double-spindle design, and which is claimed to greatly increase tube rolling capacity, is announced by The Airetool Manufacturing Company. Tests carried out by the company show that it will roll up to 30 tubes per minute, depending on the speed of the motor used. The new dual-spindle rolling tool combines two Model 1000 Airetool controls in a single operating unit, incorporating all of the advantages of the original Airetool unit and making possible the rolling of approximately 1,800 tubes per hour. Like the Model 1000 the new unit automatically controls tube expansion by precise measurement of torque output and is claimed to be accurate to 0.001 of an inch; this degree of accuracy being obtained through the torque-sensing cam mechanism which is completely unaffected by variance in air pressure. A finger-tip micrometer adjustment can be quickly set to the desired torque without using any tool, and the calibrated ring permits setting as low as 0.5 foot pounds, and up to 37 foot pounds torque at 90 lb./sq. in. Air operation of the dual-spindle rolling tool makes it economical in use, and it has been designed to roll tubes ranging in size from ½-in. to 1-in. The standard unit operates at a speed of 1,500 r.p.m., but models are available for other speeds, including 700, 550 and 400 r.p.m. (*Airetool Manufacturing Company, Springfield, Ohio, U.S.A.*)

Industrial proximity switch

Thomas Industrial Automation Limited announce the introduction of a new industrial proximity switch, with continuously variable differen-

tial control—known as the "Leveltron," the new equipment has been designed specially for industrial applications, involving free-flowing solids and liquids, while in addition it can be used for monitoring sight-glass or manometer levels. The "Leveltron" operates on the electrical capacitance principle whereby the change in capacitance at an electrode on the approach or recession of a material actuates a control relay. Two controls are used—the first sets the control point, while the second is used to vary the reset point, without affecting the setting of the control point, thus fixing the differential required. This allows simple adjustment to obtain the most favourable conditions for each application; subsequent re-adjustment to changing plant conditions; and in many instances, one instrument to replace two of the fixed-differential type. Long-term sensitivity of less than 1 pF is claimed, due to an improved circuit design and layout; "triggered" relay action to eliminate "chatter" or "creep"; components being conservatively rated to minimise drift; and "fail-to-safe" high- and low-level operation to insure against component failure. A simple form of selector is provided to obtain either high- or low-level operation. Measurements may be made at distances up to 160 yards from the point of detection. Three basic instruments are available, namely, general purpose, heavy industrial, and remote control. For the basic unit, the relay has a switching capacity of 250-V, a.c., 5-amp. max. (non-inductive), while for the heavy industrial model, the relay is of the contactor-type with a guaranteed switching capacity of 440-V a.c., 5-amp. max., or 250-V a.c., 10-amp. max. (non-inductive). Power consumption is approximately 10-W for the general purpose model, and 13-W for the heavy industrial. (*Thomas Industrial Automation Limited, Station Buildings, Altrincham, Cheshire.*)

Squirrel-cage motor starter

Lee Guinness Limited have secured from the A.O.I.P. company of France the sole manufacturing and selling rights in the United Kingdom and the Commonwealth, excluding Canada, for the "Startormatic" squirrel-cage motor starter. This apparatus is of the primary-resistance type, but employing thermo-variable liquid resistances in place of fixed metallic resistances. It ensures greatly reduced current peaks during starting, and can be simply calibrated to provide the correct torque for any drive, while giving smooth and continuous acceleration of the motor. Six sizes of starter are available for motors up to 100-h.p. The complete starter comprises a triple-pole line contactor, three resistance units, one in each phase, and a triple-pole short-circuiting contactor under time control. Thermal overload protection is provided as standard. The action of the resistance units is based

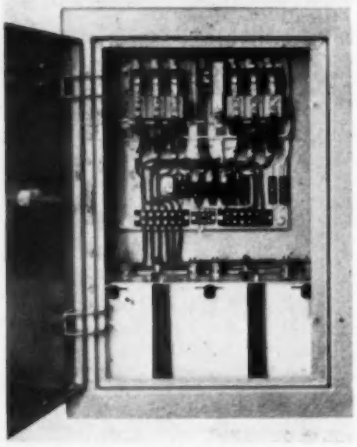


Fig. 6. Interior of a "Startormatic" starter for a 25-h.p. motor. (Lee Guinness Limited.)

on the reduction in the resistance of certain electrolytes when their temperature is raised; this reduction being in the ratio of about 5 : 1 over the temperature range employed in the apparatus during the starting cycle. The resistance assembly is contained in a reinforced polythene tank; the complete equipment being housed in a sheet steel case which may be wall or floor mounted according to size. The starter can be arranged for local or remote control. (*Lee Guinness Limited, Newtownards, Northern Ireland.*)

High-pressure pipe connections

Ruston-Grayloc high-pressure pipe connections employ sealing principles which are claimed to be entirely different from those of any other seal, they are lighter and smaller than conventional bolted flanged connections for a given duty, and can be made or broken rapidly and repeatedly, using the same seal member. The connection has three main components:—a metal seal member consisting of a rigid ring with a tapered shoulder on each side to form sealing lips; hubs machined with a taper seat of slightly greater angle to mate with the seal member lips; and a two- or three-bolt clamp. It can be supplied in a standard range from 1-in. to 30-in. and to suit pipes prepared for butt-weld, socket-weld or threaded connections. Butt-weld and socket-weld hubs are available throughout the complete range, and threaded connections are available up to 8-in. pipe-size. On assembly, the seal member and its hubs form a line seal as soon as they touch. As the clamp is tightened during assembly, the lips of the seal member deflect, within the elastic limit, to form a surface seal with the mating hubs, the sealing force being provided by the stored energy of the stressed seal member. The rigid ring of the seal member serves two purposes. It prevents mechanical damage to the seal member by over-tightened bolts, and it provides a solid link through the connection to prevent external forces from adversely affecting the seal's effectiveness. As the difference in taper between the sealing lips and the hub's mating surfaces is small the seal action is gentle and, on the connection being dismantled, the lips resume their normal geometry. There are no extreme pressures to cause galling or scoring and there are no forces great enough to cause seat marks in the hubs. There is no significant differential thermal expansion or contraction throughout the

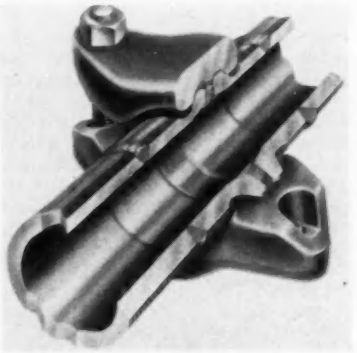


Fig. 7. Cutaway view showing component parts of a Ruston-Grayloc high-pressure pipe connection. (Ruston & Hornsby Limited.)

connection, and no resilient gasket which may be affected by temperature changes or thermal stresses. The sealing principle can be extended by special design to provide extreme leak-tightness in such diverse applications as closures for autoclaves, heat-exchangers and for connections throughout hydraulic and steam systems. (*Ruston & Hornsby Limited, Lincoln.*)

Electric motor for vibrating drives

A new electric motor, specially designed for vibrating drives, is now being produced jointly by The English

Electric Co. Ltd. and the Grantham Electrical Engineering Co. Ltd. This completely self-contained unit provides an inexpensive and reliable drive by eliminating all the mechanical parts associated with an eccentric-shaft arrangement. Vibration is generated by out-of-balance weights at either end of the motor which can easily be adjusted by single bolts to give the required output. The motor is totally-enclosed, dust-proof and weather-proof. The frame is of nodular cast-iron, with integral feet, and the shaft is of high tensile steel to withstand the high centrifugal forces to which it is subjected. Because of its vibrating motion, the motor must be mounted on a resilient base. Operating at 1,500 r.p.m. synchronous speed, it has a power output of up to 7,500-lb. centrifugal force, or 10,000-lb. at 3,000 r.p.m., which is ample for all applications at present envisaged. The motor is operated from a three-phase 50 c/s supply at 110-650-V. Greater outputs and other supply frequencies can be provided for. The motor is constructed to B.S. 2613, having Class "E" insulation on the windings, which permits a temperature rise of 65 deg. C. in a surrounding temperature of 40 deg. C. The range at present covers ½ to 1½ h.p. (*The English Electric Co. Ltd., Bradford, and Grantham Electrical Engineering Co. Ltd.*, 6, *Wharf Road, Grantham, Lincs.*)

A new central showroom at the Cricklewood headquarters of **S. Smith & Sons (England) Limited,** was recently opened by H.R.H. The Duke of Edinburgh. Here the range of products manufactured by the company and its associates are set out in the form of a permanent exhibition. Among special displays, one with the general title "In Step with Industry," exhibits examples of instrumentation available for a variety of industrial applications. **Kelvin & Hughes (Industrial) Limited** contribute to this section; an item of particular interest being the company's new Auto-Control for shell-type boilers. This is claimed to be the first automatic boiler control specially designed for shell-type boilers supplying either low-pressure steam or high-pressure hot-

The automatic boiler control display at the new Smiths Centre.

water. The system is all-electric, and in operation changes in steam pressure, due to load variations, are detected by a master-controller and converted to electrical impulses. These impulses are used to adjust fuel input by varying the stoker speed, and to control the air supply by means of motorised dampers. Features of the new system include a balanced-draught control and interlock system to prevent blowback; and a control system for d.c. type stoker motors which, the company claims, ensures an accurate fuel feed.

Lancashire Dynamo Electronic Products Limited, Rugeley, Staffordshire, announce that their "TLC" transistorised capacitance-operated level-control equipment has been approved by the Factory Inspectorate as being intrinsically safe, as defined in British Standard 1259 of 1958. Certificate number IS.3086 has been granted for the Hydrogen/Ethylene/Pentane Class, which includes service with many gases encountered in industrial processes, of which one of the most important is the petroleum group. The new intrinsically safe units, which utilise standard fittings for probes and other accessories, are now in production, and the manufacturers will be glad to provide further information in respect of any specific application problem.

* * *

William Boby & Co. Ltd., Rickmansworth, Herts., have been awarded a contract by Courtaulds Limited for a complete fully-automatic demineralisation plant for a new Russian synthetic fibre factory.

* * *

A new publication issued by **Henry Wiggin and Co. Ltd.,** Thames House, Millbank, London, S.W.1, and entitled "Wilco-Wiggin Thermometals," provides basic information on Wilco-Wiggin Thermometals. It gives a brief description of the various grades of Thermometals, and a series of tables showing the thermal properties, formulae for various shapes and temperature deflection. Three further articles on fabrication, heat-treatment and mounting complete this very informative publication, which can be obtained free on request from the publicity department of the company.

* * *

Ashmore, Benson, Pease & Co. Ltd. (member of the Power-Gas Group), Stockton-on-Tees, have received a contract valued at approximately £4 million for the design, manufacture and erection of two complete blast-furnaces for Richard, Thomas & Baldwins Limited. The two furnaces will each have a hearth diameter of 30-ft. and will be installed at Spencer Works, near Newport, Mon., to provide iron for Richard, Thomas & Baldwins Limited's new integrated steelworks and strip mill.

* * *

Firth-Vickers Stainless Steels Limited, Staybrite Works, Sheffield, 9, have issued a technical leaflet (Publication No. 518), dealing with "Centrifugally Spun Boiler Tube Plates and Similar Heavy Section Discs." The data obtained during metallurgical tests is given.

Midland Silicones Limited have just published a technical booklet describing the cold curing silicone rubbers. These rubbers, which are made in three grades, have been developed at the Midland Silicones plant, Barry, Glamorgan, and were recently put on a regular production basis. The great advantage of these products is that they need no heat cure; the addition of a small quantity of catalyst converts them at room temperature into heat-stable rubbery products. No special equipment or skill is needed. The booklet "Cold-Cure Silastomer" describes in detail the properties of these rubbers, explains how they are processed, lists established uses and suggests many more. The publication is well illustrated and has several tables on which the properties of these products are clearly set out. Midland Silicones Limited supply these products in three grades: Cold-Cure Silastomer 9159, the heavy grade which can be moulded, milled or calendered; 9160, the medium grade suitable for spreading and caulking techniques, and making flexible moulds; and the fluid grade, 9161, which can be used for dipping, injecting or impregnating. "Cold-Cure Silastomer" (Ref. No. Silicone Notes K 28-2) is available from Midland Silicones Limited's head sales office, at 68, Knightsbridge, London, S.W.1, or any of the five area sales offices.

* * *

A new brochure issued by **Bell's Asbestos & Engineering Limited,** Slough, Bucks., describes "Viceroy" insulation materials for applications where hot-face temperatures do not exceed 650 deg. F. "Viceroy" materials are built up from corrugated asbestos paper, interleaved with aluminium foil to form a multiplicity of air cells. The material can be supplied in sectional form for pipework, as flat panels, or panels curved in one plane.

* * *

Crofts (Engineers) Limited, Bradford, England, have issued a new publication (No. 359) dealing with the company's ½-in. pitch range, of Power-grip Timing Belts. The publication gives technical data in tabulated form, concerning these drives.

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Professor Ronald E. Lane, C.B.E., Nuffield Professor of Occupational Health at the University of Manchester, has been appointed part-time medical adviser to the Electricity Council. In this capacity the Professor will also act as medical adviser to the N.J.A.C. and to the superannuation schemes of the industry.

OVERSEAS Steam Engineering Practice

Abridgments of recent articles in the colonial and foreign technical press, concerning design and progress in the technique of steam generation and power plant equipment

250-MW thermal power station in Italy

Two Italian electricity companies, Societa Elettrica Selt-Valdarno and Societa Romana di Eletticita have recently undertaken a joint venture—a new 250-MW capacity power station, known as the Santa Barbara station. The boilers for the new station are designed to burn lignite from the deposits of Castelnuovo dei Sabbioni and Allori in Valdarno, about twenty-five miles south of Florence. Brown, Boveri & Co. Ltd. were responsible for the design of the station, together with the manufacture and installation of certain plant and equipment; the principal sub-contractors responsible for the boilers and auxiliaries being the Deutsche Babcock & Wilcox. The main plant comprises two boilers, and two 125-MW capacity turbo-alternators of the three-cylinder type, running at 3,000 r.p.m., utilising steam at 1,004 deg. F., and 1,493 lb./sq. in. Although the boilers were designed by Deutsche Babcock & Wilcox, one of them was built by the Italian company, Societa Breda Elettromeccanica e Locomotive, Milan. Both are of the radiation and convection, natural-circulation type, and they are of semi-outdoor construction. Each unit is rated at 8 26,875 lb./hr., with pressures of 1,778 lo./sq. in. in the boiler drum, and 1,565 lb./sq. in. at the superheater outlet. The temperature at both the superheater and reheat outlets is 1,013 deg. F. At full load, feedwater is supplied at 430 deg. F. The boiler furnaces are duodecagonal in shape, a design which the manufacturers claim has proved ideal for high-capacity boilers burning lignite. Each unit is served by six lignite mills, one acting as standby, and is provided with twelve burners placed in six of the twelve furnace walls. The boilers are also designed to burn heavy fuel-oil, and for operation with this fuel, 24 steam-atomising burners are provided. Ash and slag from the combustion of the lignite are continuously collected and blown by compressed air into a silo, from which a special ropeway carries these waste materials to a disposal area. Condensate recovered from the single-flow condenser associated with each turbine is heated in six heat-exchangers, the first three of which are designed as surface heaters using steam bled from three points in the turbine l.p. cylinder. Steam from the i.p. cylinder, mixed in two de-aerating heaters, heats the fourth stage. Beneath each of the de-aerating heaters, there is a feedwater tank from which the feedwater is extracted under pressure and at a temperature of approximately 412 deg. F. by the feedwater pumps. After passing through two further heaters the water is fed to the boiler at a pressure of 2,361 lb./sq. in. These latter heaters are the fifth and sixth stages in the feedwater heating and are supplied with steam bled from two points in the outlet from the first two cylinders. Each unit is provided with two electrically-driven and one turbine-driven feedpumps, a further electrically-driven feed-pump being available as standby for both units. Water for cooling the condensers and auxiliary flows in a closed-circuit, and is cooled in two natural-draught cooling towers. The necessary make-up water is chemically-treated before entering the cooling or thermal circuit. Equipment for the control and supervision of the boilers is accommodated in a single control room. Controls for the auxiliary drives, and for operating the valves, etc., are actuated by servo-motors, and are housed in two control desks. Two control boards contain the recorders and controls for the main plant. All measurements are converted to electrical impulses and transmitted to their appropriate instrument. The recorders provided include multi-point units which register temperatures at a number of points throughout the boilers. The burner flames, and the drum water-level can be observed by means of a closed-circuit television system. (*Brown, Boveri Review.* Vol 46, No. 3, pp. 163-81.)

Electricity supply in France

The latest report of Electricité de France indicates that despite the general slowing down of expansion, the consumption of electricity in France during 1958 continued to increase at a greater rate than had been estimated, and to a greater extent than the general development of the country's economy. The price of electricity rose more slowly than the general level of prices, and the reason put forward for the industry's improved financial position was an increase in productivity. The installation of five 125-MW boiler/turbo-alternator units is reported, these machines bringing the installed capacity of thermal plant up to 4,537-MW. A 250-MW set for installation at Saint-Ouen was authorised during the year, and work was speeded up to enable natural-gas from Lacq to be utilised in the new stations at Artix, Bordeaux and Montereaux. It is suggested that the use of natural-gas deposits at Lacq will be an important factor in maintaining the industry's improved position. Total consumption in France during 1958, including losses, rose by 7.5 per cent. to 62,044 million kWh. The output of all hydro stations (E.d.F. and others) rose from 24,800 million kWh in 1957 to 32,200 million kWh in 1958; the output of thermal stations fell from 32,600 million kWh to 29,400 million kWh. Hydro stations of Electricité de France produced 23,850 million kWh in 1958, an increase of 24.8 per cent., which was 74 per cent. of the total output from hydro stations. Thermal stations belonging to Electricité de France produced 12,450 million kWh or 42 per cent. of the national output from thermal stations. These stations are for a large part required to compensate for changes in hydro conditions, and their output varied in the ratio of 1 : 3 between August (593 million kWh) and January (1,732 million kWh). Thermal efficiency increased by 6.7 per cent. Fuel used amounted to some 4.8 million tonnes of coal, 742,000 tonnes of lignite, 594,000 tonnes of oil and (from November 1st,

1958) 23 million cubic metres of natural gas from Lacq. Sales of electricity (excluding exports) by Electricité de France rose by 8.3 per cent. to 43,700 million kWh; 33,500 million kWh at high voltage (an increase of 8 per cent.) and 10,210 million kWh at low voltage (an increase of 9.7 per cent. During the year under review, exports of electricity were 646 million kWh and imports 1,062 million kWh.

Snowy Mountains scheme

The Australian Snowy Mountains scheme is designed to divert the waters of the Snowy River westwards through the Great Divide Range to the dry plains of the interior, utilising the water for power generation and irrigation instead of allowing it to flow to waste through the well-watered coastal belt into the Tasman Sea. Although the plant for power generation is hydro-electric we have from time to time mentioned the progress made in connection with this vast undertaking. It is now reported that the second hydro-electric power station, Snowy T.1, has been completed, and was recently officially opened by Sir William Hudson, Commissioner of the Snowy Mountains Hydro-Electric Authority. Snowy T.1 accommodates four 110,500-h.p. Francis-type English Electric Co. Ltd. water-turbines driving four 80,000-kW generators. The turbines, which are controlled by four 6-ft. dia. straight-flow inlet valves also supplied by English Electric, produce their rated output at a head of 960-ft. At the maximum net head of 1,095-ft. the output from the turbines rises to 134,500-h.p. Guthega M.1B, the first station to be completed under the scheme, is equipped with two English Electric 44,500-h.p., 30,000-kW water-turbine driven generating sets and ancillary equipment.

Revised British Standard

Of the revised edition of B.S. 1016, "The analysis and testing of coal and coke," Parts 1-8 and Part 11 have already been issued. Part 12, "Caking and swelling properties of coal," is now available, and deals with the determination of the crucible swelling number and of the Gray-King coke type of coal. The method for the determination of the crucible swelling number is essentially unchanged, except that electrical heating is now a permitted alternative to gas heating. The determination of the Gray-King coke type has not previously been introduced in a British Standard, although the coke type has been used for some time as a parameter for coal classification. In its original form the test was known as "the Gray-King Carbonisation Assay at 600 deg. C." when yields of coke, gas, tar and ammonia were determined in addition to the coke type. The determination in its present form, which is now described as the Gray-King coke type, deals only with the assessment of the coke type and is not concerned with quantitative yield. For coals of high crucible swelling number, the Gray-King coke type was originally determined after dilution of the sample with electrode carbon; it has recently been shown that the latter may be replaced by certain anthracites without affecting the results obtained. The 22-p. publication contains six large and fully-annotated diagrams. Copies of this Standard may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1. Price 6s. (Postage will be charged extra to non-subscribers.)

* * *

Combustion Chemicals Limited, 33, Dorset Square, N.W.1, announce the conclusion of what is believed to be the first successful independent, full-scale trial on a small Babcock & Wilcox boiler of 323 sq. ft. heating surface, and burning heavy residual fuel oil, for the determination of the reduction in sulphur dioxide and sulphur trioxide in flue gases. This trial was conducted by the National Test Laboratory in Paris, and the official report shows that Desulfurol sulphur inhibitor and fuel-oil improver, when added to residual fuel-oils at 1 part per 1,000, not only largely inhibits the formation of sulphur oxides, but also improves certain qualities of the fuel oil, CO_2 levels and steam output are substantially increased, and flame temperatures are appreciably higher. The control of sulphur exercised by the introduction of Desulfurol to the fuel-oil in the storage tank is claimed to lead to a substantial reduction in the build-up of sulphate scale and acidic soot deposits in boiler operation, and in sulphur fumes and sulphur contamination in furnace installations. Desulfurol is manufactured and marketed throughout the United Kingdom only by Combustion Chemicals Limited, and is one of a range of chemical treatments, in both liquid and powder form, for every type of liquid fuel from petrol and diesel fuel oil, to the heaviest residual fuel oils.

* * *

Midland Heating & Ventilation Co. Ltd.

At the beginning of December, Midland Heating & Ventilation Co. Ltd., Birmingham, held a dinner and dance to celebrate the company's Golden Jubilee, and to present long service awards to numerous employees. Originally formed to exploit new practices in central heating and associated engineering, the company was incorporated in 1909, with Mr. C. H. Harton as manager. Mr. Harton subsequently became managing director, which position he held until his retirement in 1949, when the company became associated with the Carter Thermal Industries group. It was then that future policy was based on fundamental research and project engineering, and plans for substantial development began to take shape. Today, the heating division operates in a substantial way, being designers and contractors for office blocks, factories, etc., whilst the plate and sheet works, now housed in modern factories, construct fans, blowers, evaporative cooling-towers, dust-arresting plant and associated equipment, not only for the home market, but also for export to many parts of the world. The company's association with a group of five other operating companies, each specialising in separate aspects of heat transmission, air conditioning, refrigeration, air movement, heating and so forth, place it in a favourable position to engineer the largest and most complicated schemes and to undertake their construction and commissioning with undivided responsibility.

To explain to employees in the electricity supply industry the functions of joint consultation, **The Electricity Council** has sponsored a film entitled, "Talking to Some Purpose," which is to be shown at meetings at district level throughout the industry. The film, a preview of which was given in London recently, was made by R.H.R. Productions Limited, in association with the Film Producers' Guild, and is in "Ektachrome." At the start, cartoon technique is used to stress the importance of good human relations. An employee's request for canteen facilities at an appliance repair depot, which was turned down for reasons which were not effectively explained, is then presented to illustrate how dissatisfaction can arise when consultative machinery is lacking. In the second half of the film, Sir Josiah Eccles, deputy-chairman of the Electricity Council, makes a direct appeal for active support for the work of the local advisory committees. Introducing the film at the preview, Mr. D. G. Dodds, Industrial Relations Adviser to the Electricity Council, whose appointment as deputy-chairman of the Merseyside and North Wales Electricity Board was recently announced, said that the L.A.C.s had become an essential part of the industry and the aim of the film was to "get their work across" to the people they represented.

* * *

Lewis Berger (Great Britain) Limited have made available a new one-coat stoving enamel, known as "Bergercron," which is based upon acrylic resins, with special modifying ingredients. It can be applied by all the conventional methods to practically any metal, and on baking gives a hard, insoluble, infusible coating. The physical properties of the enamel can be varied to provide the highest corrosion resistance and durability or extreme flexibility to suit particular requirements. The new enamel is usually applied to a thickness of about 0.0016-in., or the equivalent of a conventional primer and enamel. "Bergercron" is normally stoved at 350 deg. F. for 30-min., but process times can be halved by stoving at 375/380 deg. F. Even in the event of the stoving time being inadvertently increased to double the normal period, there is no discolouration or damage to the finish.

Latest Power Plant Patents

These extracts from British Patent Specifications are reproduced by permission of The Controller of H.M. Stationery Office. (Complete British Specifications can be obtained from the Patent Office, 26, Southampton Buildings, London, W.C.2. Price 3s. 6d. each, both inland and aborad.)

Heat-exchanger

It is known that the heat transfer from flowing fluids to their flow boundaries is hindered by boundary layers of fluid forming in the flow-path close to the flow boundary. The boundary layers constitute substantially heat-insulating interlayers of fluids between the flowing fluid and the flow boundaries so that the heat transfer is greatly obstructed. It has been discovered that an effective way of improving the heat transfer is to reduce the thickness of the boundary layer and not to disperse it as hitherto by creating eddies in it by means of roughenings or projections. According to this invention, the thickness of the boundary layer is reduced by withdrawing repeatedly fluid from the boundary layer. As indicated in Fig. 1 a heat-exchange fluid (3), e.g. hot air, flows in the direction of the arrow (6). It is desired to increase the heat transfer from the heat exchange fluid (3) to the flow boundary (1), e.g. a sheet-metal wall. Close to the flow boundary (1), a boundary layer (2) of fluid is formed, which is withdrawn at (4). Just behind the point of withdrawal there is practically no boundary layer, although the same builds up again to the next point of withdrawal (4), where it is again withdrawn. As a result, large areas between the flow path (3) and the flow boundary (1) are practically free of such boundary layers, and in these areas the heat transfer from the fluid (3) to the wall (1) is practically unobstructed. Any boundary layer (2) which begins to form, is withdrawn immediately at (4). It is apparent that the withdrawals at (4) take place at successive points of the flow-path. The withdrawal results from the pressure difference between the two sides of the wall and may be effected, e.g. by suction at point (4) by blowing out the boundary layer portions (2) under super-atmospheric pressure into a space of lower pressure. It is indicated in Fig. 2, that the boundary layer areas (2) are withdrawn by the dynamic pressure built up on the upstream side of obstructions (5), shown exaggerated in size for clearness. Fig. 3 shows the same processes for a curved flow. In this case too, the boundary layers (2) building up, are withdrawn according to arrows (4) on the upstream side of projections (5). The direction of flow is indicated by arrows (6). Withdrawal of the boundary layers may also be effected from a twisting flow, as shown in Fig. 4. the arrow (6) indicating the direction of the substantially helical path of the heat-exchange fluid. Where the helical path impinges the obstructing edge (5), the previously built-up boundary layer areas are withdrawn according to the arrows (4). In this case, the advantage is obtained that the boundary layer areas are withdrawn particularly at the beginning of the flow-path by negative pressure in the pipe (7). This negative pressure may be produced by suction devices or result automatically from the fact that the higher frictional resistance to the flow of fluid in the tube (1) is due to its extended helical path as compared with the shorter straight path of flow, and lower frictional resistance in the pipe (7) produces a pressure difference between the two heat-exchange fluids. *British Patent No.* 823,543 *issued to Waagner-Biro A.G. Complete specification published November* 11*th*, 1959.

Fig. 1 (top).

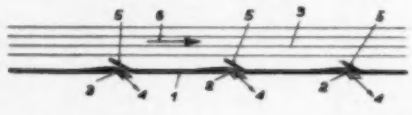



Fig. 2 (bottom). British Patent No. 823,543.

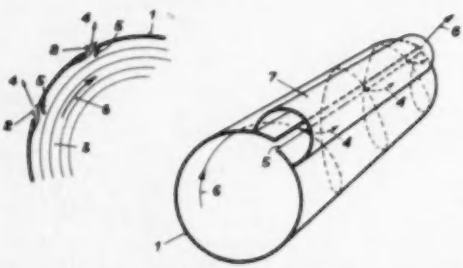


Fig. 3 (extreme left).

Fig. 4. (left). British Patent No. 823,543.

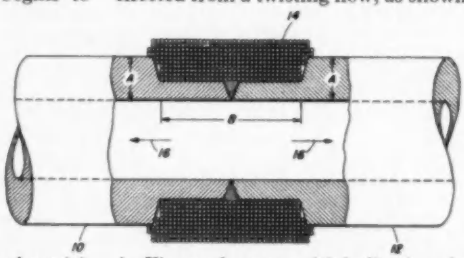


Fig. 5. British Patent No. 823,751.

Reinforced butt joint

This invention relates to a method of butt-joining tubes, and particularly very thick-walled tubes of which at least one is of an austenitic steel alloy suitable for withstanding extremely high pressures and temperatures. Fig. 5 shows a pair of tubes (10 and 12). Both of these tubes may be of an austenitic steel, high in chromium-nickel content, or one may be of austenitic material while the other may be of ferritic steel. The wall thickness (A) is of the general order of 1 in. or more, so that upon butt-

welding the tubes by a method involving building the weld up by multi-layers, the joint may, as experience has shown, crack in service along the heat affected zone adjacent the weld. The wall thickness of these tubes is reduced for a short distance from the ends to be joined together by reducing the outside diameter of the tubes. The tubes have their wall thickness reduced in this manner sufficiently so that assurance will be had that the resulting joint will not crack in service. After the tubes have been welded together; the joint is wrapped with wire (14) which must have the same coefficient of thermal expansion as the tube metal. The wire wrapping extends throughout the entire axial length of the reduced end portions (B). The wire is wrapped in helical fashion, and many more layers are provided than is required to offset the decrease in hoop strength caused by the reduction in wall-thickness. This greatly reduces the stress within the weld over that which would prevail if only the amount of reinforcing that is theoretically required were used, and accordingly decreases the likelihood of failure of the weld. It is essential that wire is used for the wrapping because it is necessary that there be uniform stress throughout the extent of the reduced portion of the tube-ends. Otherwise, uneven stresses would develop in the proximity of the weld because of the very great changes in pressure and temperature to which it would be subjected during boiler operation, and these uneven stresses would be very likely to cause failure of the weld. Because wire has very fine grain size, and accordingly good hot ductility, all the turns of the wire will eventually take uniform stress even though the wrapping may initially not be uniform. *British Patent No.* 823,751 *issued to Combustion Engineering, Inc. Complete specification published November* 18*th*, 1959.

Boiler for nuclear plant

This invention relates to water-tube boilers for nuclear power plants. In Fig. 6 the casing duct (*a*) of the boiler is one of a large number of units (a^1, $a^2 \ldots a^n$), as shown diagrammatically in Fig. 7. Each unit delivers steam through the pipe-lines (10) provided with a shut-off valve (11) into the main steam-header (12) of the installation. The dimensions chosen for each elementary boiler (*a*) are such that one or several of them can be temporarily withdrawn from the assembly without the remainder of the installation ceasing to function. The hot fluid travelling through the duct (*a*) is introduced at the top in the direction of the arrows (*A*) and leaves at the bottom end. Each boiler comprises an assembly consisting of an economiser, water-tubes and a superheater. A water container (*e*) extends over the full height of the boiler proper. This container may comprise an enlargement in the

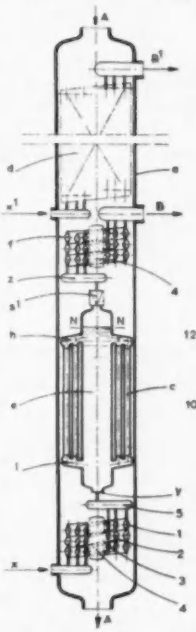


Fig. 6 (left). British Patent No. 823,904.

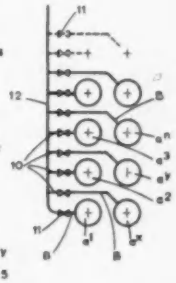


Fig. 7 (above). British Patent No. 823,904.

regions of the water-level in order to permit easier discharge of steam. Two rings of secondary headers (*h* and *i*) are fitted on the sides of the vessel (*e*), and to these headers are connected the water-tubes (*c*), which are placed in the direction of flow (*A*), and in such manner as to radiate around the axis of symmetry so as to uniformly occupy the space available for the flow of fluid (*A*). The economiser indicated in the lower portion is formed by circuits comprising coiled tubes. Three circuits (1, 2 and 3) are provided, which are supplied in parallel. The tubes are of elongated section, and are enlarged at their lateral walls so that the passages available to the hot fluid between the two coils are of variable section. The tubes are of different dimensions according to the distance at which the tube circuit to which they belong is disposed from the axis of the assembly; i.e. the tubes of the outer circuit (1) have a larger surface than the central circuit (2), which themselves have a larger surface than those of the circuit (3) which are closest to the central axis. A shut-off member (4) is provided axially of the device to cause the hot fluid (*A*) to pass to the circuits (1, 2 and 3). The helical pitches formed by the circuits (1, 2 and 3) can be different. *British Patent No.* 823,904 *issued to A. Huet. Complete specification published November* 18*th*, 1959.

Header for tubular heat-exchanger

This invention relates to tubular heat-exchangers comprising a number of similar units. Each unit consists of an assembly of parallel tubes and a bi-compartmental header. Referring to Fig. 8, each header comprises a hollow body part (*a*) which is open at both ends, and has a bell-shaped conical bore. The ends of the body part containing the portion of the bore of smaller diameter is closed

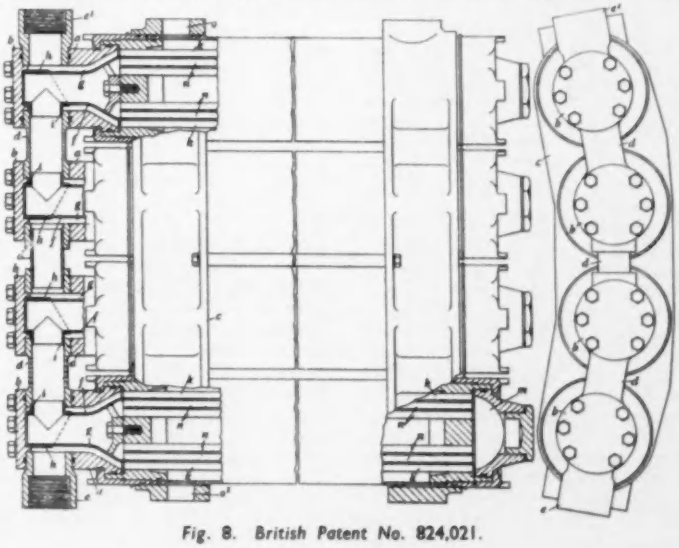


Fig. 8. British Patent No. 824,021.

by a cover-plate (*b*). The outer-end is adapted for attachment to the housing (*c*) of the tube assembly. Also, the portion of the body part to which the cover is attached has formed in it a pair of oppositely-arranged sockets for reception of the ends of coupling or connecting pipes (*d*) and inflow and outflow pipe connections (*e* and e_1). Within the header is a coaxial tubular insert (*f*) corresponding in shape to the configuration of the bore in the header, and forming with the bore an annular passage (*g*) which at one end is open to one of the sockets only. Also, on the end of the insert adjacent to the socket is freely mounted a closely fitting, but angularly movable, sleeve (*h*) with a lateral spigot (*i*), which can enter the adjacent end of a connecting pipe. Assuming, for example, that the apparatus consists of four similar heat-exchange units arranged parallel with each other, one of the sockets of the first header is adapted to receive the inlet connection (*e*), to be attached to a fluid-circulating pipe system. This header is connected to the second by a short connecting pipe (*d*) with one end inserted in the other socket of the first header and its other end inserted in one of the sockets of the second header. The spigot (*i*) on the sleeve of the insert of the first header occupies one end of this connecting pipe, and the corresponding spigot in the second header occupies the other end of the pipe. The second and third headers are connected together by another connecting pipe (*d*), and the spigots (*i*) of the third and fourth headers each occupy one end of a further connecting pipe (*d*) between the third header and the fourth header. The other socket of the fourth header is connected by the outlet connection (e_1) for attachment to the circulating pipe system. *British Patent No.* 824,021 *issued to Serck Radiators Limited. Complete specification published November 25th,* 1959.

Evaporator

The substance of this invention relates to evaporators for obtaining comparatively pure water such as drinking water from sea-water or brackish water. The invention is especially applicable to multi-stage flash evaporators in which the brine is circulated through a series of heaters in which it is gradually brought to a higher temperature by the latent heat of condensation of vapour which is passed into the heaters through a series of flash-chambers supplied with heated liquid from the heaters. The evaporator shown in outline in Fig. 9 comprises a series of heaters (10) and a series of flash chambers (12). Brine to be evaporated is passed through each heater in turn along the piping (14) under the pressure of a circulating pump (16). After passing through the final heater (10*a*), the brine is passed into the first of the flash chambers (12), and from there through each flash-chamber in turn. The pipes (18) serve to connect the flash-chambers in series. Some of the heated brine evaporates in the flash-chambers, and the vapour is passed into the heaters (10), with the exception of the final heater (10*a*), through pipes (20). The flashed vapour passed into the heaters (10) gives up heat to the brine passing through the piping (14), and collects as condensate in the heaters. The final heater (10*a*) does not receiver flashed vapour as heating medium, but instead receives steam through a pipe (22) from a steam boiler (24). To enable the boiler (24) to be supplied with make-up water from the evaporator, and not from the outside, provision is made for producing vapour condensate in the heater (10*b*) of a purity which is higher than that produced in the heaters (10*c*). The condensate which collects in the heater (10*b*) is withdrawn and passed into the boiler (24) through a pipe (26). Steam condensate from the heater (10*a*) is also passed into the boiler through a pipe (28). The flash-chamber (12*a*) supplying the heater (10*b*) is designed to be larger in cross-section than the other flash-chambers to allow for operation with lower vapour velocities. It is also equipped with more efficient water-separation equipment (30) which ensures that the distillate produced in the heater (10*b*) is of a much higher quality than the bulk of the distillate, and has a purity satisfactory for boiler make-up purposes. In general, the use of such special water-separation equipment will also involve an increased pressure-drop for the flow of vapour through the separators, resulting in some loss of output from the flash-chambers in which such separators are installed. This evaporator renders unnecessary the additional and considerable expense of providing elaborate water-separation equipment, and of increasing the cross-section of the flash-chambers (12) throughout the equipment which would be necessary if the whole plant were to be made to deliver distillate of a purity acceptable for boiler make-up purposes. It also avoids the loss of output which would almost certainly result if special water-separation equipment were to be installed in all the flash-chambers of the plant. The distillate collected in the heaters (10*c*) is cascaded down from heater to heater, and is removed by a distillate extraction pump (32). *British Patent No.* 824,338 *issued to Richardsons,*

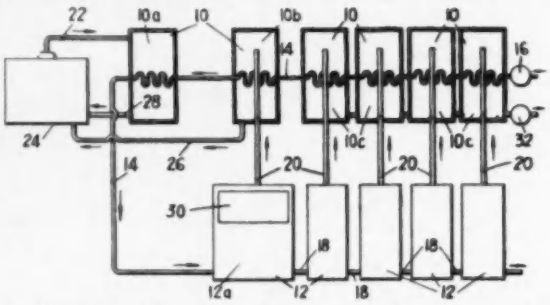


Fig. 9. *British Patent No.* 824,338.

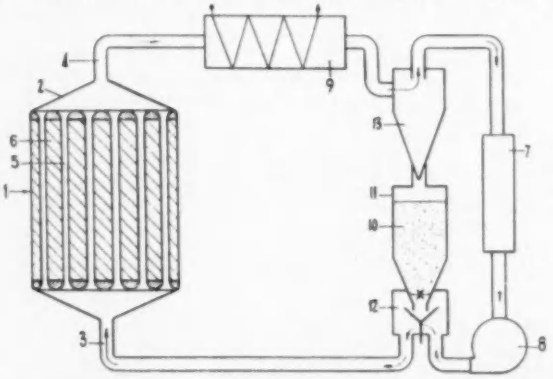


Fig. 10. *British Patent No.* 824,377.

Westgarth and Co. Ltd. Complete specification published November 25th, 1959.

Gas-cooled nuclear reactor plant

It is an object of this invention to provide a gas-cooled nuclear reactor plant with a high mass-flow without excessive blower power, and without the necessity for high-pressures of the cooling gas. Another object of the invention is to provide such a nuclear power plant in which, if the gas pressure is raised above that of the atmosphere, a considerably higher mass-flow is obtainable than was previously possible at the increased pressure. Referring to Fig. 10, the core (1) of a thermal reactor is enclosed in a shell (2) and provided with an inlet (3) and outlet (4) for carbon-dioxide gas, which is used as a cooling medium. Channels such as (5) are provided in the graphite-moderator (6) of the reactor core (1), and uranium fuel elements (which are not shown) are arranged longitudinally in each channel (5). Carbon-dioxide in a container (7) is arranged to be circulated by a blower (8) through the reactor core (1) out of the outlet (4) and through a heat-exchanger (9) to recommence its cycle. In practice, there will generally be a number of such heat-exchangers (9) and blowers (8) in different cooling-circuits, each including the reactor core (1), the inlet (3) and outlet (4) being multiple. Small particles (10) of graphite in a containing vessel (11) are introduced into the gas stream when circulation commences, through the fluidising device (12). Conditions are arranged to be such that the particles (10) are kept in suspension in the carbon-dioxide gas as it circulates through the reactor core (1) and heat-exchanger (9). Under steady conditions, the fluidised stream of gas and carbon particle-suspension circulates continuously through the blower (8), by-passing the vessel (11). On shutting down, however, or where it is desired to remove particles from the fluidised stream, a cyclone (13) is operated to remove the particles (10) and return them to the vessel (11). Load variations during operation are accompanied by a variation of the coolant flow-rate or of the concentration of the particles (10) in the gas and suspension stream. The introduction of 0.5 per cent. by volume of graphite particles into carbon-dioxide gas at approximately atmospheric pressure may increase the average density of the gas-stream by a factor of 14, which is equivalent to raising the pressure of the pure gas to 200 lb./sq. in. Graphite is a moderator and can be introduced without appreciably lowering the nuclear reactivity. It is suitable material for pneumatic conveying, and possesses lubricating properties. It is preferable for efficient heat-transfer that the fluidised stream should be turbulent. Graphite particles of from 10 to 50 microns are used, ensuring a negligible slip velocity in the turbulent gas-stream and reducing any tendency for the particles to settle out. Concentration in excess of 0.5 per cent. and up to 4 per cent. by volume of particles may be possible with adequately uniform fluidisation, and this upper limit may in turn be raised by proportionate pressurisation of the gas. *British Patent No.* 824,377 *issued to The General Electric Company Ltd. Complete specification published November 25th,* 1959.

New British Standard B.S. 3082

These new publications form Part 3 : 1959, Non-interrupted Creep Testing, and Part 4 : 1959, Interrupted Creep Testing, of a series of British Standards which will deal with the mechanical testing of steel at elevated temperatures. Both parts are based on the work undertaken by Technical Committee 17 "Steel" of the International Organisation for Standardisation, as have been tentatively approved by all the member countries represented by that committee. It is hoped that the series will help to facilitate the comparison of different steels at elevated temperatures, and to unify the methods by which the data are obtained. In both these parts, definitions of gauge length, stress and permanent percentage elongation are followed by requirements for the test piece. The methods for the determination of creep strain are given, as are the temperature limits within which the heating apparatus must operate ; the methods of measuring temperature are also specified. Other requirements deal with accuracy of the testing machine, axiality of loading, the correct functioning of the extensometer, temperature and creep readings, and the presentation of the results. Copies of these publications may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1. Price: 4s. each (postage will be charged extra to non-subscribers).

* * *

Electrical plant valued at £325,000 and comprising four 2,000-h.p. d.c. motors and twenty-two mercury-arc rectifiers will be supplied by the Heavy Plant Division, Rugby, of **Associated Electrical Industries Limited,** for a new 56-in., 3,000 ft./min. reversing cold strip mill at the Shotton Works, Flintshire, of John Summers & Sons Ltd. Two d.c. motors, each rated at 2,000 h.p., 171/478 r.p.m., 750 volts, will drive the mill, and a similar motor will drive each of the two winding reels. Each driving motor for the mill rolls will be supplied from a bank of four rectifiers, and reversal of the armature's direction of rotation, or inversion of the supply for stopping will be effected by the operation of an armature-reversing switch. To maintain constant tension at all times, each reel motor will be fed from a pair of cross-connected converter banks, one of which will provide the power for coiling and will act as an inverter during uncoiling. The other converter bank is to be loaded for deceleration during coiling, when the converter acts as an inverter, and during acceleration of the reel for uncoiling.

* * *

A somewhat unique ceremony was held on December 7th, 1959, in the social centre at the Cathcart Works of **G. & J. Weir Limited,** when presentations were made to 102 employees who have completed forty years' or more service with the company. Each recipient was presented by the chairman, the Viscount Weir, C.B.E., with an inscribed gold watch. The veterans, drawn from all sections of the company, comprise 15 women and 87 men, including the managing director and the works director. They are not all employed at Cathcart, some being members of the staffs from the offices of the company in London, Manchester and Newcastle. Apart from the two directors concerned 36 are office staff, and 49 are employed in the works. All, except five, are still working with the company, the five having recently retired after completing 40 or more years. The average length of service is 44 years amongst works personnel, and 42.6 years among the office staff—the aggregate "score" of the 102 employees reaching the stupendous figure of 4,416 years ! The annual presentation of long service watches by the chairman is a long-established custom at Weir's, but in the past, the requirement was 50 years. As from August, 1959, however, the qualifying period has been reduced to 40 years. It is interesting to note that when the fifty-year awards were made to seven employees last year, there were 67 members of the "Fifty-Year" Veterans Club.

* * *

A contract has been awarded to **William Boby & Co. Ltd.,** Rickmansworth (Herts.), for the supply of a demineralisation water-treatment plant for the boiler plant at the Rugby Works of A.E.I. (Rugby) Limited. A contract has also been awarded to Boby's by the Treforest Chemical Company for a demineralisation plant for the purification of gelatine solution.

* * *

Ferranti Limited, Hollinwood, Lancs., have received an order from the Electricity Corporation of Nigeria for transformers worth over £70,000, for the extensive transmission scheme in the Western Region of Nigeria. The order covers the supply of three 12.5-MVA units, 132/11 kV fitted with resistor-type on-load tap-changing gear ; one 5-MVA unit, 132/33 kV fitted with resistor-type on-load tap-changing gear, and one 33 kV earthing transformer. Transmission at 132-kV represents a new "high" for Nigeria, and reflects the scale of the extensive development programme now being undertaken. The consulting engineers are Messrs. Preece, Cardew and Rider.

NOTES *Personal* AND *Industrial*

Dr. D. W. Davison, F.Inst.P., F.I.M., has been transferred to the Central Personnel Executive staff, at the head office of The Plessey Co. Ltd., Ilford, to assist the personnel director with scientific and technical appointments throughout the company and its associates.

* * *

Sir W. H. Bailey & Co. Ltd., Patricroft, Manchester, have appointed **Mr. R. N. Bartley,** the North-Eastern counties representative, to be responsible for Scotland also. He can be contacted at 79, Ravensbourne Avenue, East Boldon, Co. Durham (Boldon 2133).

* * *

Associated Electrical Industries Limited have appointed **Mr. Stanley White** as their chief press officer. He has now taken up his post in the Central Information Department to co-ordinate the press side of the manifold activities of the largest electrical manufacturing group in Great Britain. Mr. White joins A.E.I. after a brief spell as deputy director of public relations at the Ministry of Defence. Until July last, he was chief press officer to the United Kingdom Atomic Energy Authority which he joined on its inception in 1954. Before this he was a press officer at the Ministry of Supply, with special responsibilities for atomic energy. Earlier he had been press liaison officer with the Allied Commission Austria.

* * *

Mr. D. C. Lorkin, F.C.I.S., who, since August, 1958, has been carrying out the responsibilities of managing director of Lancashire Dynamo Holdings Limited, chairman and managing director of Lancashire Dynamo & Crypto Limited, and chairman of Crypto Limited, and Dynamo & Motor Repairs Limited, has, at his own request, relinquished the position of managing director of Lancashire Dynamo Holdings Limited, to enable him to concentrate on his remaining activities. **Lt.-Col. G. S. Marston,** D.S.O., M.C., chairman of Lancashire Dynamo Holdings Limited, has accepted the additional responsibility of managing director of Lancashire Dynamo Holdings Limited, and will, for the time being, operate as chairman and managing director of the group.

* * *

Mr. H. P. Forder and **Mr. A. R. Hay** have been appointed directors of The United Steel Companies Limited.

* * *

Walker, Crosweller and Co. Ltd., has announced the appointment of **Mr. C. F. Taylor** as general manager of the Leonard mixing-valve division of the company.

* * *

Mr. G. B. R. Feilden, managing director, Hawker Siddeley Brush Turbine Company, and chairman of National Free Piston Power Limited, has been appointed to the board of Hawker Siddeley Industries Limited.

Mr. R. J. Horlock, of the export department of John Thompson Limited, Wolverhampton, has been appointed manager of the Group's new branch office in Buenos Aires, Argentina. Mr. Horlock has been with the John Thompson Group for 25 years. Before returning to Wolverhampton early in 1959, he was for 11 years contracts engineer at the Group's Calcutta office, from where for some time he supervised site constructional work in India.

* * *

As a result of a group reorganisation, the Board of The Chemical and Insulating Co. Ltd. has been reconstituted as follows:—**Mr. D. J. Grant,** chairman; **Mr. F. R. Gibson,** managing director; **Mr. G. Banks, Mr. K. C. Plumbe** and **Mr. F. Sawdon.**

* * *

Mr. J. A. Hepworth, B.Sc., M.Inst.Gas E., has been appointed chief engineer of the North Thames Gas Board. He succeeds **Dr. J. Burns** who has become deputy-chairman of the Board.

* * *

Mr. H. Morley has been appointed a director of Samuel Fox and Co. Ltd., a subsidiary of The United Steel Companies Limited.

* * *

The General Electric Co. Ltd. announces that **Mr. T. B. Ellis** has been appointed secretary in succession to **Mr. T. B. O. Kerr,** who has been appointed director for finance and administration.

* * *

Mr. Eric A. Robinson, M.I.Mech.E., has been appointed chairman of Stein Atkinson Vickers Hydraulics Limited, in place of **Mr. H. C. J. Russell Smith,** who has resigned, but will remain on the board.

* * *

Mr. N. A. H. Tomblin has been appointed secretary of the British Electrical Power Convention in succession to **Mr. J. W. Simpson,** O.B.E., F.C.I.S., who retired from that position on November 30th. Mr. Tomblin was educated at King's College, Wimbledon, and Pelham School. He joined Edmundsons Electricity Corporation Limited, in 1934, but his service was interrupted by the war, during which (1939-45) he was on military service. He became chief assistant to Mr. Simpson in 1949.

* * *

Mr. Sam Black, head of the publicity department of the British Electrical and Allied Manufacturers' Association, resigned his post at the end of December to take up a new position in publishing. Mr. Black had been associated with B.E.A.M.A. since 1955, and has been very active on its behalf in connection with publicity and exhibitions.

* * *

Mr. K. R. Simmonds, B.Sc. (Eng.), A.M.I.E.E., has been appointed general manager of the International Rectifier Co. (Gt. Britain) Ltd., Oxted, Surrey.

Mr. D. N. Steeley has been appointed sales manager of Standard Industrial Motors at the G.E.C. Engineering Works, Birmingham. Mr. Steeley joined The General Electric Co. Ltd. as a student apprentice in 1949. He completed his national service with the Royal Navy in 1956 and attained the rank of lieutenant. On his return to the company he was appointed an assistant branch engineer in London.

* * *

Powell Duffryn Engineering Co. Ltd. has acquired the whole of the share capital of **Pipeweld Limited,** Paston Road, Wythenshawe, Manchester, 22. Pipeweld Limited has for many years undertaken all forms of pipework, including installations at oil refineries and at oil, chemical and gas plants as well as long distance pipelines, jacketted and terminal pipework and jetty pipework.

* * *

William Boby & Co. Ltd., Rickmansworth (Herts.), are sub-contractors in an American contract which has attracted considerable interest since it was awarded to Britain. The award, in fact, caused questions to be asked in the U.S. Congress as to why the contract had gone overseas. Boby's are to provide for **C. A. Parsons & Co. Ltd.,** demineralisation plants for service in connection with the supply of cooling-water for the condensers of the 550-MW turbo-alternator set which C. A. Parsons are supplying to the Tennessee Valley Authority.

* * *

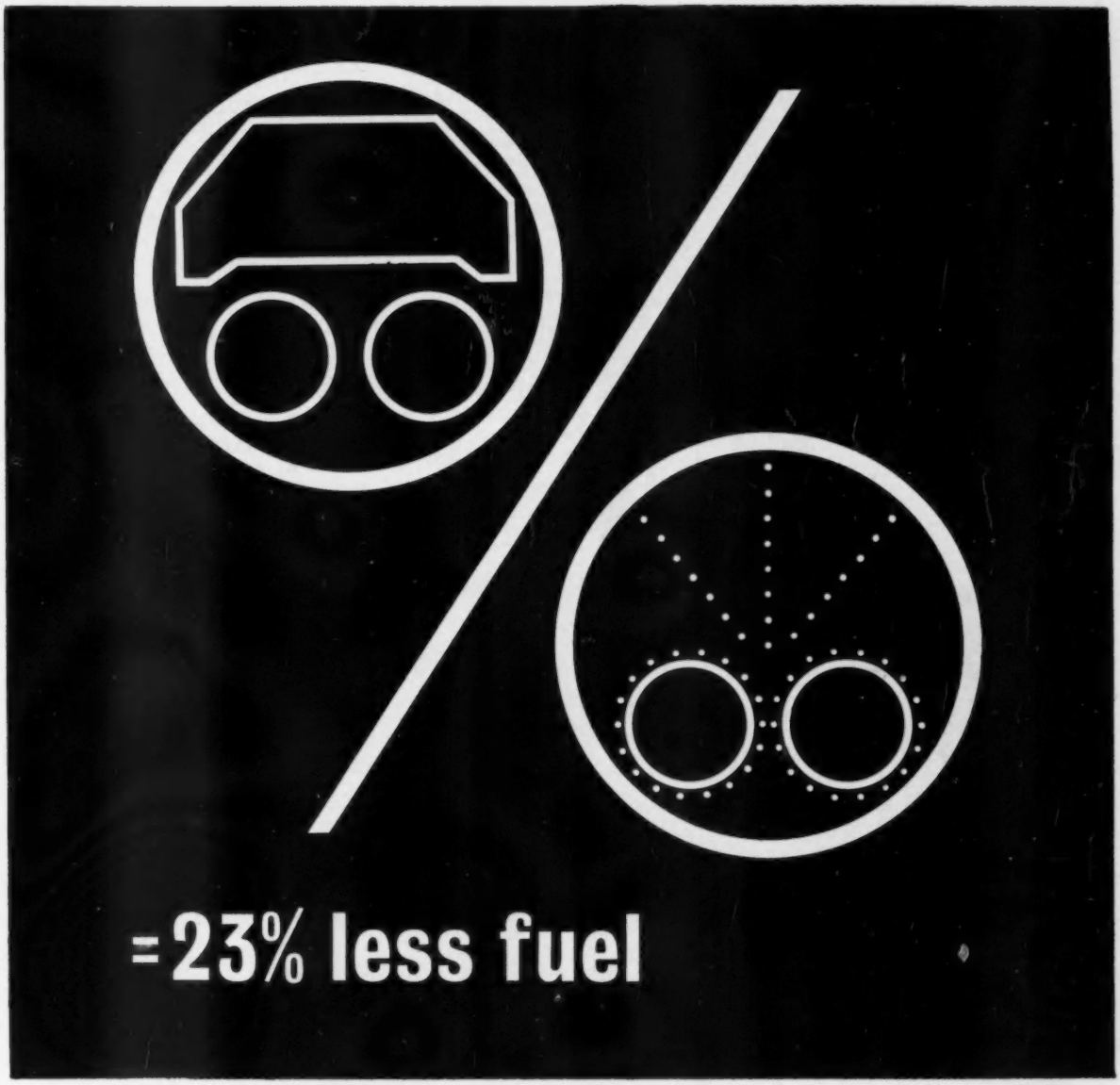
Elliott-Automation Limited announce that negotiations are proceeding with **Manufacture de Machines Du Haut-Rhine S.A.** ("Manurhin") of Mulhouse, France, with a view to arrangements being made for the manufacture in France of automation equipment. Manurhin is an old-established engineering business with large manufacturing plant at Mulhouse, and in other parts of France. It is proposed that Elliott-Automation will take a financial interest in Manurhin.

* * *

During the first week in December, the third of the four reactors at the **United Kingdom Atomic Energy Authority's** Chapelcross station in Dumfriesshire went into full production. Mr. G. R. Howells, works general manager at Chapelcross, said that the fourth reactor was due to be fully-operational by the end of March next, when the station would supply 140-MW to the grid as well as producing plutonium for military purposes.

* * *

Laurence, Scott & Electromotors Limited, Norwich, recently issued a new publication (No. 154), entitled "Asmag" Automatic Control System for N-S Variable Speed A.C. Motors. The publication gives information on standard performance of "Asmag" and on applications of the system.



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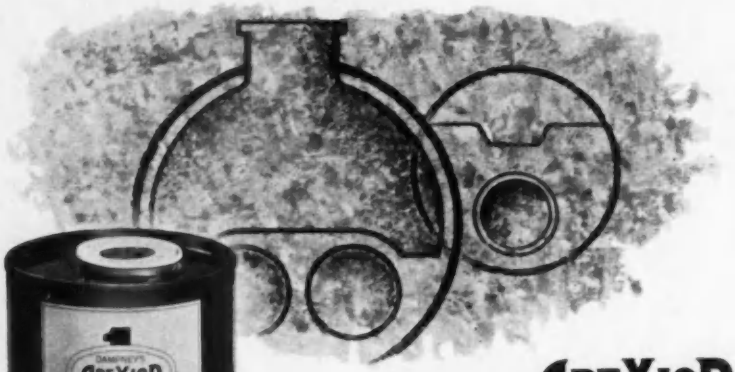

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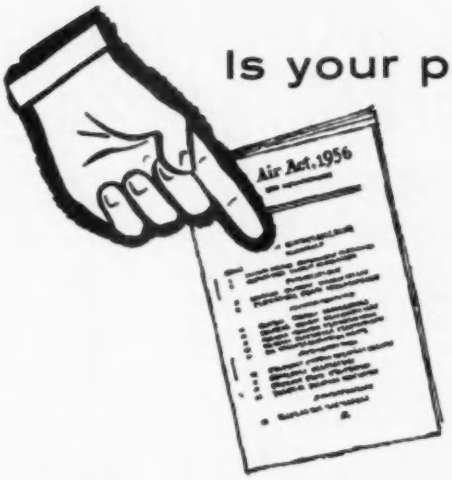

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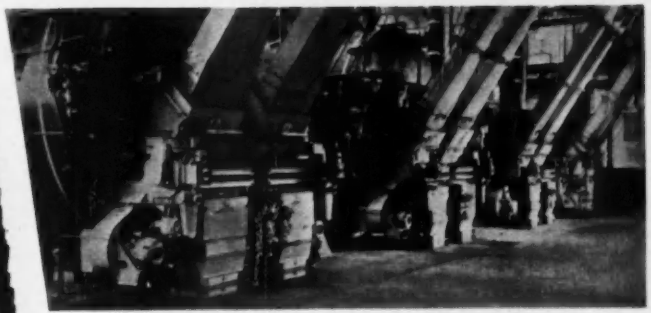

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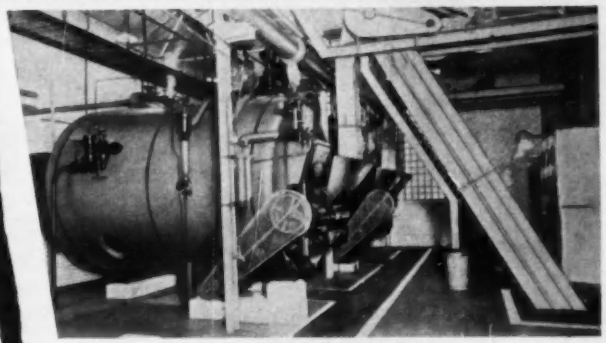

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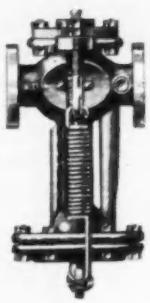

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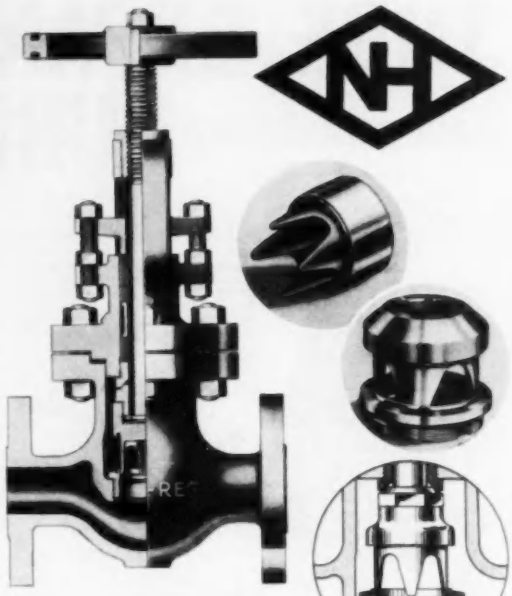

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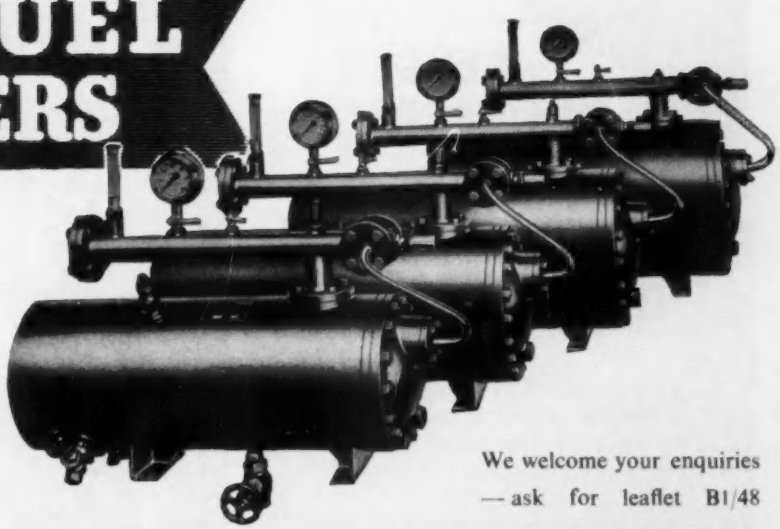

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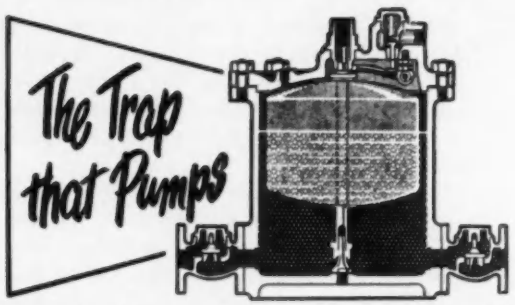

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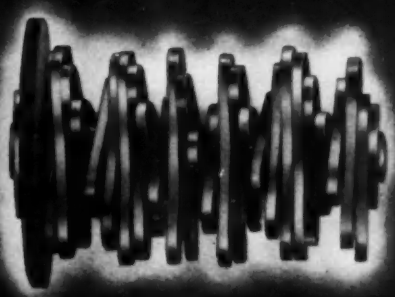

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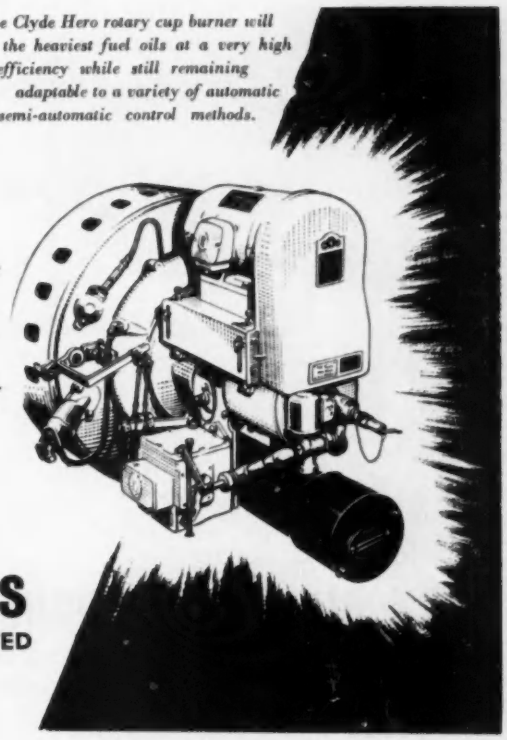

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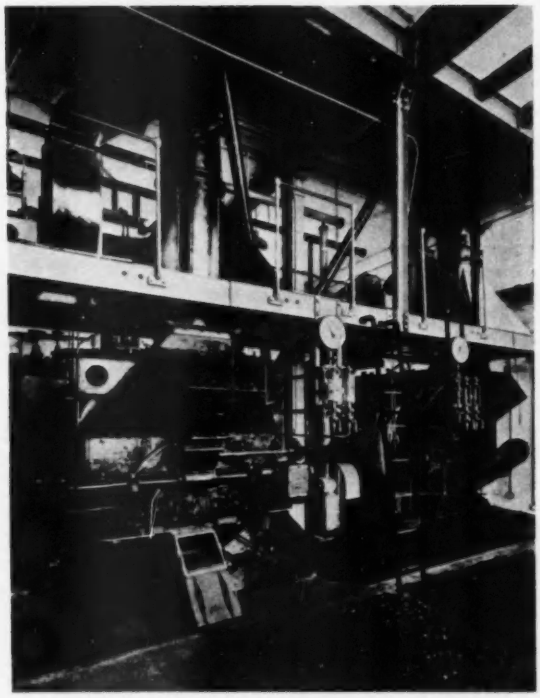

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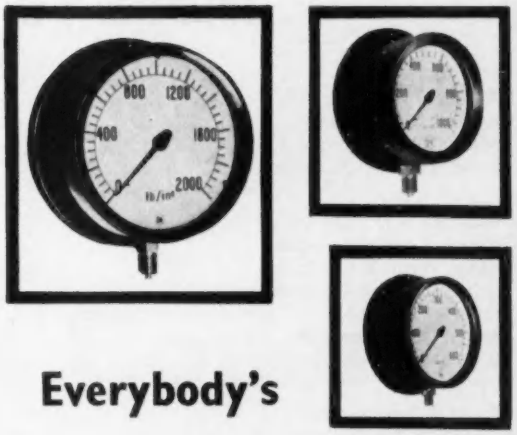

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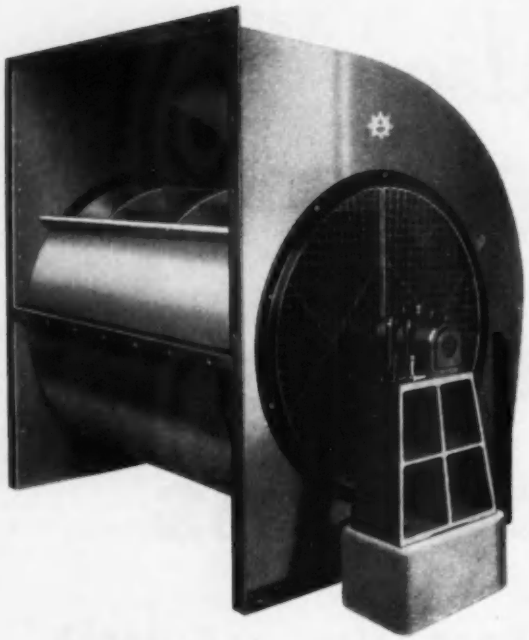

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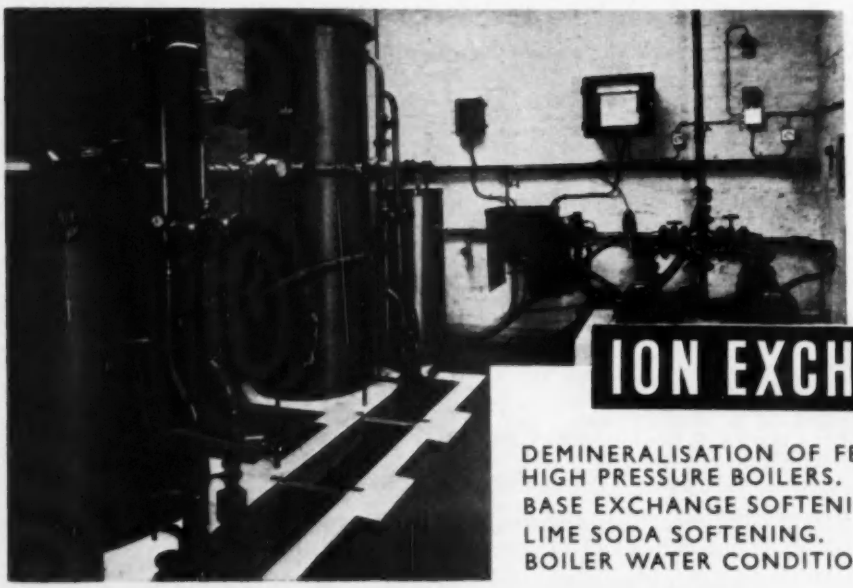

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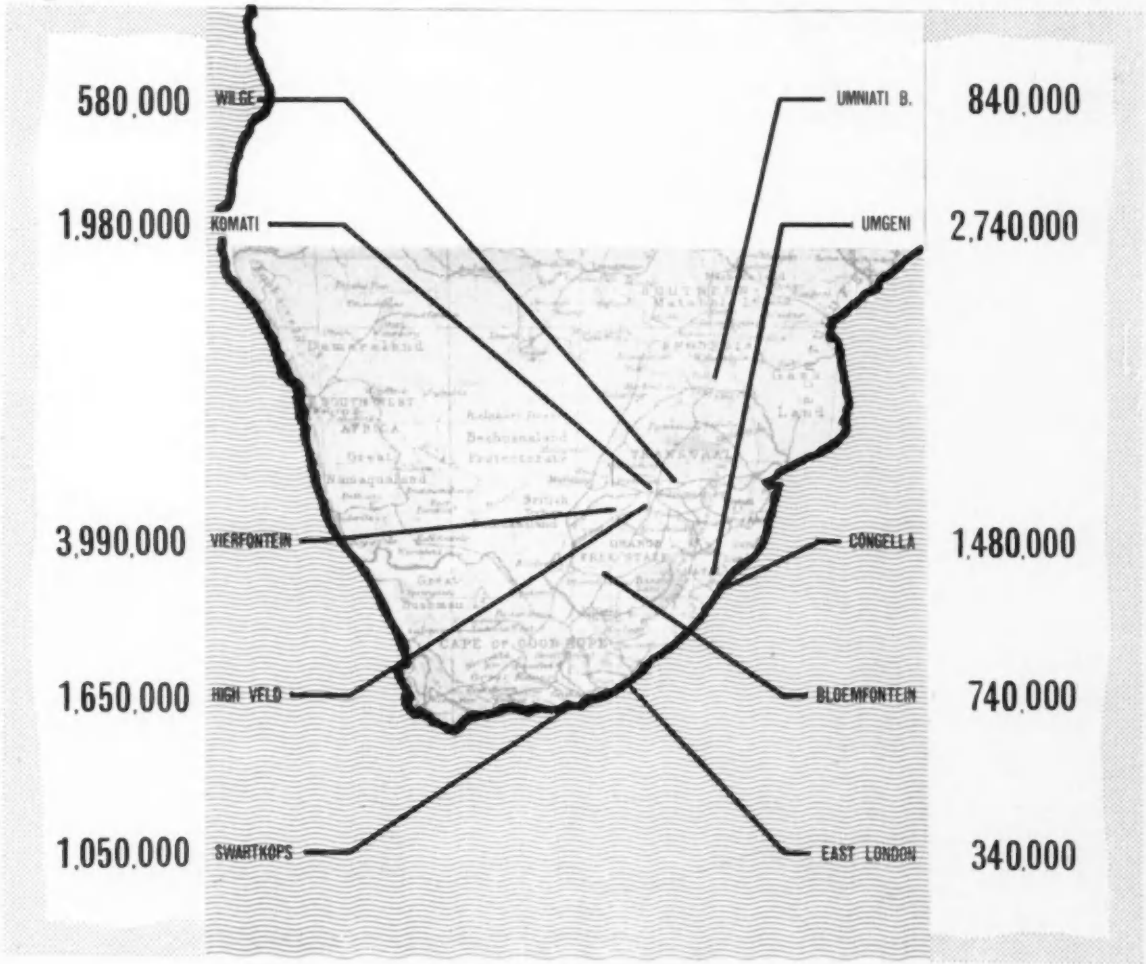

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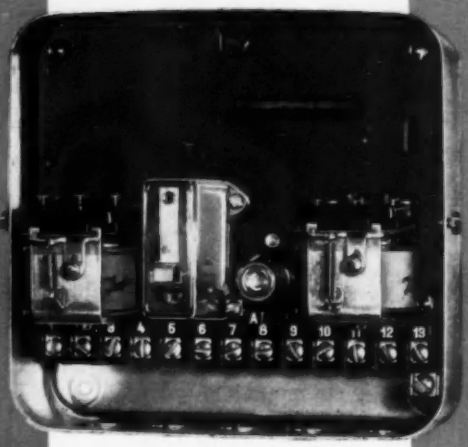

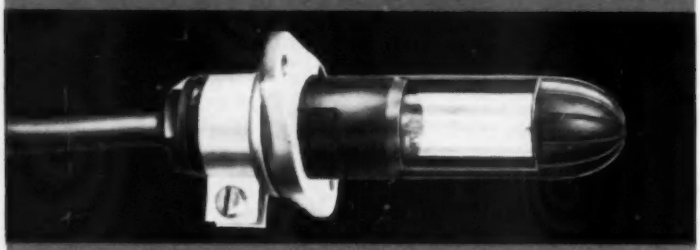

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